POPULAR
Computing
WEEKLY

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This Week

News Desk

No new Texas machine

TEXAS Instruments has announced that it will not now replace the ageing TI99/4A computer until 1984, at the earliest

The disclosure has followed speculation, following Texas' disastrous recent financial results that the company may be seeking to reduce its long term commitment to the home computer market

The loss making US company had been expected to announce an up-market TI99/8 machine to compete with the Commodore 64 computer. The 99/8 although not displayed publicly at the Chicago CES Show in June was shown there to some select customers

If as now seems likely the 99/8 is never produced it will be the second TI machine within a year to be developed but never sold Earlier this year TI announced the 99/2 a low cost silent black-and-

Continued on page 5

Seiko tunes up with micro music

MICRO music is on the way in the form of digital music keyboards which will connect to home micros

The first such offerings look like being from Seiko but other companies will follow suit

By Christmas Seiko plans interfaces for its new DS101 and DS202 stereo music keyboards to enable them to be connected to the Sinclair Spectrum and Commodore 64 computers An interface is already available for the Apple II machine

These first units will be quite pricey — the DS101 the cheaper of the two and will sell for around £400

It has a standard 61 key C scale console and offers a choice of 16 voices including piano organ flute brass and strings Effects include vibrator and sustain

Additional units — the DS310 Digital Synthesiser and DS320 Digital Sequencer can also be added to provide more advanced music handling

At the back of the two keyboards is an interface con

Continued on page 5



Classified Classified Classified Classified

Computer Swap 01-437 4343

Free readers entries to buy or sell a computer Ring 01-437 4343 and give us the details





16/48K SPECTRUM RAQUEL presents her game for age 18 and over only (state age when ordering) only £3 50 I Brooks 17 Malvern Coleman Street Southend Essex

ZX81 16K WARRIOR KING. Exciting new game from Lenn Software Send cheque/PO for £4 95 to F MacDonald 80a Turners Road Mile End E3 4LE

Continued on page 47





27 October-2 November 1983 Vol 2 No 43

SUNSHINE

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Programs should, whenever possible, be computer printed.

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Accuracy

Popular Computing Weekly cannot accept responsibility for any errors in programs we publish, although we will always try our best to make sure programs work.

This Week

Editorial

Home computer manufacturers, particularly in the US, are running scared.

Atari, once the flagship of the industry, lost $180m in the third quarter of this year. In total, Atari has lost some $536m so far this year with the fourth quarter results still to come.

Texas Instruments, which has also recorded massive losses this year, is considering dropping its new 99/8 home micro. Mattel has already decided to pull out of Aquarius. Even Apple has run into difficulties with its Lisa machine.

The image of the micro industry as a golden egg laying goose is looking distinctly tarnished, not to say bedraggled. It is no coincidence that the shares of Acorn were not exactly oversubscribed when the company joined the Unlisted Securities Market earlier this month. City investors are considerably more wary about the prospects for micro companies than they were a year ago.

The decision facing companies such as Atari is whether or not they should continue to sustain these huge losses in the expectation of enormous profits in the future. Some companies, at least, seem certain to decide the price for staying in the market is too high.

It will be interesting to see which companies are still around in a year's time.

Next Thursday

Move your spade around the grid picking up as many diamonds as you can. Finish one grid and move on to the next level. Beware, though, you only have three lives. Diamond Digger — next week's star game for Spectrum by Jim Provan.

Free kick for 64

COMMODORE claims Soccer for the Commodore 64 is "the most amazing piece of software in the world".

Whether you believe that or not Soccer is certainly a step forward in terms of animated games.

In it you play a passable imitation of football controlling one of seven players using a joystick. The player you control is always the one nearest the ball. The fire button shoots or, in the case of a defending goalie, causes your man to jump to save the ball.

At half time the players leave the pitch to return shortly after and at the end a royal-looking figure presents a cup to the winning captain who raises it aloft.

The game is played against the computer or using two joysticks against another player.

Soccer *will be available on cartridge by the end of November. No price has yet been fixed for the game.*

Taxas

Continued from page 1

white machine. The 99/2 was squeezed out as the US price war forced the existing 99/4A price down into the 99/2's price range.

Recently also Texas has dramatically cut the price of the 99/4A and encouraged software support for the machine — moves intended to keep the 99/4A going.

Micro music

Continued from page 1

nection to allow them to be connected to a home micro using an interface which is expected to cost around £10.

This will enable you to store your compositions in Ram or save them out to cassette, Microdrive or floppy disc.

Also using specially written software and a printer you will be able to get a hard-copy printout of the music you have written in conventional music notation.

If the digital sequencer is also connected then it will be possible to program the sequencer switching from the computer and call it up when required from the music keyboard.

IBM profits up and up

IBM, expected to launch its low cost Peanut computer in November, has announced a big third-quarter increase in sales and profit.

Hardware sales are up 40 percent to $5 29bn and profits have risen almost 25 percent to $1 3bn.

Sales of personal computer products now account for some three percent of IBM's income.

Mister Microchip, MP

THE Government has been urged to appoint a 'micro-chip' minister to look after Britain's rapidly expanding computer and electronics industry.

This recommendation was made in a report prepared by Sir Ieuan Maddock, former chief scientist to the Department of Industry, and presented to the National Economic Development Office (NEDO).

The NEDO report suggests that a microchip ministry is vital if the UK's computer and electronics manufacturers are "to be able to face up to competition from the US and Japan."

The Seiko range of music keyboards is distributed in the UK by Rosetti, 138-140 Old Street, London EC1.

Shepherd goes for Microdrive

RICHARD Shepherd Software seems likely to become the first company to produce software specially for the ZX Microdrive.

However, the program — *Cash Controller* — will be sold only on cassette, not micro cartridge.

"A program to handle personal finance is an obvious application for the ZX Microdrive," explains Richard Shepherd. "That way it takes less than 90 seconds to load the program and change an entry."

Yet, *Cash Controller* will be sold on cassette with a save-to-microdrive option in the main program menu.

"Originally we planned to offer the program on Microdrive straight away, but there is no easy way of duplicating large numbers of the micro cartridge. And Sinclair is only offering a trade price for quantities ordered in excess of 500.

"That number is just not realistic at the moment — it's a substantial proportion of the total number of Microdrives so far supplied to customers."

Cash Controller will be available in mid-November, priced at £9 95.

Fantasia converts adventures

BY the end of October Digital Fantasia hopes to have completed conversion of its ten Mysterious Adventures to run on the 48K Spectrum, Commodore 64, BBC and Atari computers.

All are traditional adventures with graphics, written by Brian Howarth.

The next two programs in the series are also well on the way — *Waxworks* is planned for the beginning of November and *Midwinter* should be out by Christmas.

Details of Spectrum and BBC versions from Digital Fantasia, 24 Norbreck Road, Norbreck, Blackpool and Commodore 64 and Atari versions from Channel 8, 51 Fishergate, Preston, Lancs.

NewBrain goes Dutch

IT now looks as if a Dutch buyer had been found for the ailing NewBrain computer.

Final agreement is expected this week under which development and distribution of the NewBrain will be taken over by Tradecom, the machine's existing distributors in Scandinavia, the Netherlands, Belgium, Spain and South Africa.

A buyer for the NewBrain has been sought since August when Grundy Business Systems, its developers, went into liquidation owing £3m.

Lynx winner

TWELVE-YEAR-OLD Alan Broady from Coventry has been selected as the winner of our Lynx competition held in August.

In the competition, we asked readers to send in their ideas of what their ideal computer would be like.

Alan's ideal machine included a flat-screen colour monitor offering a 1 000 × 1 000 resolution in Super Mode, joysticks connected to the computer by a radio controller rather than conventional lead, a range of built-in processors including Z80A, 6502 and 6809, together with a selection of seven high level languages.

Other special features included voice input and the ability to receive data broadcast directly from satellites.

As winner, Alan receives the prize of a Lynx computer.

Symbolic problems

As a total newcomer to home computers and computing, I buy your magazine regularly to try and get some idea of what's what.

Although I do not own a computer yet I have the occasional use of a friend's Spectrum, and I am already an addict. I would be grateful if you can help me with a couple of problems.

My first problem is *symbolic*. In your issue dated 22-28 September (Vol 2 No 38) you published a game called *Harrier Pilot* by Colin Jones. On line 260 it says Inverse 1 then a black blob; am I right in assuming that this blob is the number 1 printed inversely? In the same vein, in the issue of 29 Sept-Oct 5 (Vol 2, No 39) you have *Centipede* by Jim Provan. There are some strange symbols in this also and I would love an explanation.

After using up so much space, I've hardly got the nerve to mention my other problem, but here goes.

When I eventually get my computer, one of the uses I want it for is cataloguing a huge number of books (my collection). Can you tell me (in language I can understand) how to go about it?

The type of format I require is something similar to a list of phone numbers, names and addresses, ie Bill Smith 16 Black Road 632 0103.

I know I'm asking a lot, but I really am stuck and would appreciate your help.

G H P Springer
50 Severn Drive
Garforth
Leeds
LS25 2BB

All the problems you have understanding symbols can be traced to one source — user-defined graphics.

The Spectrum like many other home micros allows you to define certain keys with a shape of your own design and then use this shape within your programs.

All the programs you mention use this technique, which is quite well explained in the Spectrum manual. Usually a programmer will tell you what key he has assigned each shape to, ie, you will see something like: Line 20 Graphic E, Graphic B, Graphic A. What this means is that when you enter this line and come across a user-defined shape you should go into Graphics mode and press E, followed by B, followed by A.

To begin with you will just see the letter but when you run the program you will find it has changed into the tank, centipede, or whatever the game requires. If the programmer does not tell you which key is which, then just press any key (A-U) when in graphics mode, and after you run the program put the right graphic in the right place. You can find out what graphic is assigned to which key by simple trial and error — go into graphics mode and press a key until you find the shapes.

Regarding your other problem, what you require is a uni-file or vu-file type program. You could either buy a commercial package, Psion, for example, do *Vu-file* or you could use David Lawrence's *Unifile* which can be found in *The Working Spectrum*, published by Sunshine Books.

High score table

After reading this week's publication (6-12 October), I felt I had to comment on the matter of a games high score table. You said that there were two problems in doing this: (a) you would not know if the score was genuine; (b) you would not know which games to include.

Well, I have the solution to both these problems. To check that the score was genuine you could insist on either a screen dump on a printer or a photograph of the screen. A good game for each computer could be used, such as *Donkey King* for the Dragon and something like *Penetrator* or the highly rated *Jet Pac*.

If you are not satisfied with my second solution, then run a poll for a couple of weeks and find the most common games and use them. I am sure this would be a large incentive for users to buy the weekly to see if their name is up in lights.

Jonathon Whitehouse
18 Lebanon Gardens
Biggin Hill
Kent
TN16 3HB

PS I think *New releases* is 'tnf'.

While not infallible, a screen dump or photograph would go a long way towards authenticating high scores.

We would be very interested to know what other readers think of a high score table and which games should be included.

Joystick interface

I have been interested in buying a joystick interface for my Spectrum for quite some time. The only thing that has been putting me off is the fact that only specially adapted programs will work with the particular interface, which limits the amount of software that may be used with it.

Naturally, I was interested in the announcement of the Sinclair Interface 2 which acts as a Rom cartridge and joystick port adaptor. What I would like to know, is will future software, allowing the use of joysticks, be written so that it may be used with the Sinclair joystick interface?

Or will it be that only some programs will work with the interface as is the situation now with other interfaces? Also, will I be limited in the range of joysticks that I would be able to use with the interface?

I would be very grateful if you could answer these questions for me as it could decide whether or not I buy a joystick interface for my computer.

PS Your magazine is great. Keep up the good work.

PPS May I also add my plea to the numerous others for a machine code series for the Spectrum?

S Ryatt
190 Nestles Avenue
Hayes
Middlesex
UB3 4QG

We've been trying out several programs with our office interface. A lot of existing software does not function with it as it does not use the same values as, say, the popular Kempston interface.

However, the major software houses like Psion and Quicksilva already have most of their software compatible and the other companies are expected to follow suit.

The Interface 1 requires a standard Atari type d9 connector and, so far, every joystick we've tried with this type works correctly.

Video video

I own a Spectrum 48K, a video and a video camera. Is there any way (except from using the video camera) to record the picture my Spectrum produces?

I find using the video camera the picture isn't very good quality. I would like to know how this is done, because I would like to combine my computer picture with some normal filming. Please, please, please, could you tell me how it is done?

Kevin Jenkins
6 Bishwell Road
Gowerton
Swansea
SA4 5AU

We ran an article explaining how to generate video titles on a BBC Micro in *PCW* 15-21 September. Unfortunately, the Spectrum does not possess UHF or video output sockets, so you would undoubtedly need an interface of some sort.

Unfair answer?

Thanks a lot for your 'Just a nibble' article on the letters page (*PCW* 20-26 October).

Some of us who are computer newcomers (and who don't even own a computer yet) worked very hard reading the first five issues of *The Home Computing Course* in order to find that very answer for their competition. You seem to have unwittingly given the less studious amongst us an unfair advantage (mentioning no names).

I know all's fair in love and war, but in love and war you must make some effort yourself.

G Gilmore
2 Timmis Close
Cinnamon Brow
Warrington

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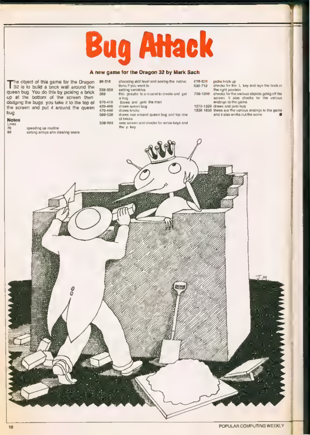
Bug Attack

A new game for the Dragon 32 by Mark Sach

The object of this game for the Dragon 32 is to build a brick wall around the queen bug. You do this by picking a brick up at the bottom of the screen then dodging the bugs, you take it to the top of the screen and put it around the queen bug.

Notes

Lines	
70	speeding up routine
80	setting arrays and clearing score
90-310	choosing skill level and seeing the instructions if you want to
330-350	setting variables
360	this gosubs to a round to create and get a bug
370-410	draws and gets the man
420-460	draws queen bug
470-490	draws bricks
500-520	draws box around queen bug and top row of bricks
530-600	sets screen and checks for arrow keys and the p key
610-620	picks brick up
630-710	checks for the L key and lays the brick in the right position
720-1260	checks for the various objects going off the screen. It also checks for the various endings to the game
1270-1320	draws and gets bug
1330 1620	these are the various endings to the game and it also works out the score



```
10 REM***************************
20 REM*        BUG ATTACK       *
30 REM***************************
40 REM***************************
50 REM* (C)1983 BY MARY SACH *
60 REM***************************
70 POKE&HFFD7,0
80 DIMA(10,10),B(30,11),D(70,10),E(10,10):@@=@
90 CLS:PRINT@224,"CHOOSE A SKILL LEVEL OF 1 TO 10":PRINT@2
   10 IS THE HARDEST"
100 PRINT@300,"";:INPUTN
110 IFN<1 ORN>10 THEN90
120 CLS
130 PRINT@257,"DO YOU WANT INSTRUCTIONS (Y/N)"
140 I$=INKEY$
150 IFI$="Y" THEN180
160 IFI$="N" THEN320
170 GOTO140
180 CLS
190 PRINT"YOU MUST TRAP THE QUEEN BUG TO DO THIS YOU MUST
   BUILD A WALL AROUND IT BUT WATCH OUT THERE ARE BUGS
   WHICH WILL FOLLOW YOU AND EAT YOU":PRINT:PRINT"TO MOVE
   YOUR MAN YOU USE THE ARROW KEYS"
200 PRINT:PRINT"PRESS A KEY TO CONTINUE"
210 IFINKEY$<>"" THEN220 ELSE210
220 CLS:PRINT"TO PICK A BRICK UP YOU MUST BE DIRECTLY OVER
   THE BRICKS AND BE AS FAR DOWN AS POSSIBLE AND THEN PRESS
   THE KEY "P"":PRINT:PRINT"YOU CAN ONLY LAY ONE BRICK AT A
   TIME AND YOU HAVE FOUR BRICKS IN RESERVE"
230 PRINT:PRINT"PRESS ANY KEY TO CONTINUE"
240 IFINKEY$<>"" THEN250 ELSE240
250 CLS:PRINT"YOU MUST THEN DODGE THE BUGS AND LAY THE BRICKS
   AROUND THE QUEEN BUG AT THE TOP"
260 PRINT:PRINT"TO LAY A BRICK YOU MUST BE AS CLOSE AS
   POSSIBLE TO THE QUEEN BUG AND THEN PRESS THE KEY "L""
270 PRINT:PRINT"PRESS A KEY TO CONTINUE"
280 IFINKEY$<>"" THEN290 ELSE280
290 CLS:PRINT"IF YOU TAKE TOO LONG THE QUEEN BUG WILL COME
   AFTER YOU AND EAT YOU ALSO IF YOU RUN OUT OF
   BRICKS THE QUEEN BUG WILL COME AFTER YOU AND EAT YOU"
300 PRINT:PRINT"PRESS A KEY TO START"
310 IFINKEY$="" THEN310
320 CLS:PRINT@[illegible]"PLEASE WAIT"
330 TIMER=0 [illegible]
340 [illegible]
350 [illegible]
360 GOSUB1270
370 PCLS
380 DRAW"BM20,90;C3R4D9L4U3D5R8D2R1E6L1U6D6G4E4F4H4U3H3F3R1E
390 GET(19,20)-(28,29),A
400 PCLS
410 GET(48,58)-(58,65),B
420 DRAW"BM150,4;C3D6R8U6F5D8G5L8N5U6E5"
430 PAINT(165,12),3,3
440 CIRCLE(150,14),2,1
450 CIRCLE(150,14),2,1
460 CIRCLE(184,20),4,1,.5,0,.5
470 FORY=1TO20 STEP8
480 FORZ=1TO50 STEP10:LINE(0+Z,16+Y)-(5+Z,169+Y),PSET,BF
   :NEXTZ
490 NEXTY
500 DRAW"C2"
510 LINE(78,0)-(123,30),PSET,B
520 FORY=85TO117 STEP8:DRAW"C3":LINE(Y,0)-(Y+4,3),PSET,BF
   :NEXTY
530 SCREEN1,0
540 IFTT=2 THEN560 ELSEIFPEEK(344)=223 THENX=X+10:H=1:GOTO
550 IFPEEK(343)=223 THENX=X-10:H=2:GOTO590
560 IFPEEK(342)=223 THENY=Y+10:H=3:GOTO580
570 IFTT=1 THEN630 ELSEIFPEEK(341)=223 THENY=Y-10:H=4
580 I$=INKEY$
590 IFE=5 ANDEE=18 ANDY=0 ANDX=<-50 ANDI$="P" THEN1390
600 IFI$="P" ANDX=<-90 ANDY=0 THEN610 ELSE630
610 IFE=5 ORE=10 ORE=15 THENEE=EE+6:E=0
620 LINE(8+E*10,165+EE)-(6+E*10,170+EE),PRESET,BF:E=E+1:SOUND
   (E+EE)*3,1:KK=1
630 IFKK=0 THEN720
640 IFTT=2 ANDX=-20 THEN670
650 IFTT=2 ANDX=32 THEN680
660 I$=INKEY$:IFI$="L" ANDTT=1 ANDKK=1 THEN690 ELSE670
670 IFI$="L" ANDKK=1 ANDTT=2 ANDX=-20 THEN700 ELSE680
680 IFI$="L" ANDKK=1 ANDTT=2 ANDX=32 THEN710 ELSE720
690 IFSS=48 THEN720 ELSEDRAW"C3":KK=0:LINE(120+SS,20)-(125+SS,
   -4),PSET,BF:SS=SS+6:SOUND20,1:QQ=QQ+150:GOTO720
700 IFJ1=30 THEN720 ELSEDRAW"C3":KK=0:LINE(120,0+TI)-(83,4+TI)
   ,PSET,BF:TI=TI+6:SOUND20,1:QQ=QQ+100:GOTO730
710 IFOO=30 THEN720 ELSEDRAW"C3":KK=0:LINE(123,0+OO)-(128,
   4+OO),PSET,BF:OO=OO+6:SOUND20,1:QQ=QQ+150
720 IFY<=-140 THENY=-100
730 IFY>=0 THENY=0
740 IFX=<-90 THENX=-90
750 IFX=>122 THENX=122
760 IFY=-60 ORX=-20 ORX=12 ORX=52 ORX=92 THENAA=-5 ELSEAA=0
770 IFX=22 ORX=62 ORX=102 ORX=-18 ORX=-58 THENBB=5 ELSEBB=0
780 PUT(99+X,150+Y)-(108+X,165+Y),A
790 IFSS=48 ANDOO=30 ANDI1=30 THEN1570
800 IFE=5 ANDEE=18 ANDY=0 THEN1390
810 IFH=0 THEN870
820 IFH=1 THENPUT(85+X,150+Y)-(95+X,165+Y),B
830 IFH=2 THENPUT(112+X,150+Y)-(120+X,165+Y),B
840 IFH=3 THENPUT(90+X,139+Y)-(110+X,149+Y),B
850 IFH=4 THENPUT(90+X,166+Y)-(110+X,170+Y),B
860 H=0
870 P=RND(3)
880 PUT(100+J,34+JJ)-(110+J,45+JJ),E
890 PUT(100+W,34+JJ)-(110+W,45+JJ),E
900 PUT(100+Q,34+JJ)-(110+Q,45+JJ),E
910 IFCT=1 ORN=>Y THEN920 ELSE940
920 PUT(150+NM,34+JJ)-(110+NM,45+JJ),E
930 PUT(150+MN,34+JJ)-(110+MN,45+JJ),E
940 IFTIMER=>250*(11-N)*1000 THENLG=5:GOTO1330
950 IFY=-30 THENJJ=90:GOTO980
960 IFY=-50 THENJJ=60:GOTO980
970 IFY=-30 THENJJ=70
980 IFP=1 THENJ=J+10:W=W-10
990 IFP=3 THENW=W+10:Q=Q-10
1000 IFP=2 THENJ=J-10:Q=Q+10
1010 IFJ>42 THENJ=42
1020 IFJ<-40 THENJ=-40
1030 IFW<42 THENW=42
1040 IFW>120 THENW=120
1050 IFQ>-40 THENQ=-40
1060 IFQ<-100 THENQ=-100
1070 IFE=5 ANDEE=6 ORCT=1 ORN=[illegible] THEN[illegible] ELSE1100
1080 RT=RND(2)
1090 IFRT=1 THENNM=NM+10:MN=MN-10 ELSEIFRT=2 THENNM=NM-10:MN=M
   N+10
1100 IFNM=>50 THENNM=50
1110 IFNM=<-50 THENNM=-50
1120 IFMN=>40 THENMN=40
1130 IFMN=<-40 THENMN=-40
1140 PUT(150+NM,34+JJ)-(110+NM,45+JJ),E:CT=1
1150 PUT(100+MN,34+JJ)-(110+MN,45+JJ),E
1160 PUT(100+W,34+JJ)-(110+W,45+JJ),E
1170 PUT(100+Q,34+JJ)-(110+Q,45+JJ),E
1180 PUT(100+J,34+JJ)-(110+J,45+JJ),E
1190 PLAY"V31L255O5"+STR$(RND(12))
1200 IF(X=2 ORX=12 ORX=22 ORX=-10 ORX=-8) ANDY=-110 THENTT=1
   :GOTO1260 ELSETT=0
1210 IFY<-110 AND(X=32 ORX=-20) THENTT=2 ELSETT=0
1220 IF(Y=<-20 ANDY=>-40 ANDJJ=90) OR(Y=<-50 ANDY=>-70 ANDJJ=
   50) OR(Y=<-90 ANDY=>-100 ANDJJ=30) THEN1230 ELSE540
1230 IF(Q=>X-7-N+AA+88 ANDQ<X+7+N-AA-98) OR(W=>X-7-N+AA+98
   ANDW<X+7+N-AA-88) OR(J=>X-7-N+AA+98 ANDJ<X+7+N-AA-88)
   THEN1470
1240 IFCT<>1 THEN540
1250 IF(NM=>X-7-N+AA+88 ANDNM<X+7+N-AA-98) OR(MN=>X-7-N+AA+88
   ANDMN<X+7+N-AA-98) THEN1470
1260 GOTO540
1270 PMODE3,1:PCLS
1280 DRAW"BM20,20;C2E3U3D3R4U3D3F3D3G3L3H3U3"
1290 PAINT(22,22),2,2
1300 PRESET(27,21):PRESET(23,20):PRESET(24,90):PRESET(27,20)
   :PRESET(28,20):PRESET(26,21)
1310 GET(20,14)-(30,25),D
1320 RETURN
1330 DIMHH(8,6),LL(3,3):GET(92,4)-(128,20),HH
1340 PUT(92+DD,4+VV)-(128+DD,20+VV),HH:LINE(190,0+VV)-(190,4+
   VV),PRESET:LINE(190,0+VV)-(190,4+VV),PRESET:IFDD=>0 THEN
   PUT(85+DD,4+VV)-(90+DD,20+VV),LL ELSEPUT(125+DD,4+VV)-
   (125+DD,20+VV),LL
1350 PLAY"V31O3L50"+STR$(RND(12))
1360 IFVV=VY+140 THENVV=V ELSEVV=VV+2:GOTO1340
1370 IFDD=X THENDD=DD ELSEIFX>DD THENDD=DD+2:GOTO1340 ELSEDD=D
   D-2:GOTO1340
1380 PLAY"T2V31O1L15ADCEFAO2L15DEFAD"
1390 IFLG=5 THEN1600
1400 CLS:PRINT@195,"YOU HAVE RUN OUT OF BRICKS"
1410 PRINT@259-F+LG,"YOUR SCORE IS ";QQ+INT(TIMER/10)
1420 PRINT@323-F+LG,"ANOTHER GO? (Y/N)"
1430 I$=INKEY$
1440 IFI$="Y" THENRUN
1450 IFI$="N" THENCLS:END
1460 GOTO1430
1470 PLAY"T4[illegible]L2[illegible]O1AAADE[illegible]O4DDDDFEDEO4DDDD3CCCCCC8BC
   1AAA"
1480 CLS:PRINT@193,"YOU HAVE BEEN EATEN [illegible]"
1490 F=2
1500 GOTO1400
1510 PLAY"T[illegible]L[illegible]FEDO4CEFFEDO"DEFEF"
1520 CLS4:PRINT@128,"YOU HAVE [illegible]"
1530 QQ=QQ+[illegible]
1540 PRINT@[illegible]"YOUR SCORE SO FAR ";QQ
1550 PRINT@[illegible]"THIS TIME BUT [illegible]
   [illegible]
1560 PRINT@320,"PRESS [illegible]"
1570 I$=INKEY$
1580 IFI$="" THENN=N+1:GOTO120
1590 GOTO1570
1600 CLS:PRINT@195,"YOU HAVE RU[illegible]"
1610 LG=1
1620 GOTO1400
```


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Elementary, Dr Watson

***David Kelly** talks to Philip Mitchell, author of* The Hobbit *and* Penetrator

Notwithstanding the several thousand miles separating him from us, Philip Mitchell still manages to exert a powerful influence on the British computer games programming fraternity.

As author of *The Hobbit* and *Penetrator* his name often comes up in conversation mentioned in hushed tones.

Some people are born with computers in their blood — everything they touch turns into bits and bytes. And Philip is one of these. He first got interested in computers seven years ago while still at school — and he built a few, designing the circuits himself.

Then to Melbourne University and a degree in computer science. While there he worked mostly with main frame machines but did a lot of programming micros in his spare time.

"You name it, I've probably built it — 2650, 6502, Z80, 68000," he says. He thinks a good hardware knowledge is an invaluable asset for a programmer. "People who have a background in that side seem to have more of a feel for machine-code because they understand more of what is going on."

Strangely, Philip feels more at home programming in machine-code than Basic.

While still at college he was recruited by Melbourne House's Fred Milgrom as one of the team to produce an adventure game based on a book by JRR Tolkein. So began *The Hobbit* adventure.

To begin with three people were involved — Philip, Stuart Ritchie who developed the text interpreter, and Veronica Megler who worked on the design of the characters and locations.

When the three finished college *The Hobbit* was still not completed. Stuart and Veronica left the project and the whole program was dumped on Philip's lap when he joined Melbourne House full-time.

All the work that had been done on the program had been written for the TRS80, so as well as finishing the program Philip had to convert it for the Spectrum. Even though Philip no longer writes for the TRS80 he still uses it for all new software development.

Now he is working on the follow up to *The Hobbit* based on the characters from Conan Doyle's Sherlock Holmes books.

In the adventure you, as Sherlock Holmes, find yourself in the company of a corpse faced with the task of finding the murderer and convincing Inspector Lastrade of Scotland Yard to arrest the culprit.

"*The Hobbit* was a starting point. What I want to do is take it a stage further. One of the attractions of *Sherlock Holmes* is the very involved personalities of the characters — particularly Inspector Lastrade and Dr Watson.

"We have now compiled an amazing amount of information. Although the program will not be based on any one story, we are trying to stick as closely as possible to the spirit of the original books."

Because the plot is a detective story there is a lot more communication required between the characters — particularly with Lastrade.

The original *Hobbit* program was in two parts. The central routines which drive the program — some 17K of machine code — and a database which defines the plot, locations and characters.

For the *Sherlock* program an entirely new database will have to be written. Also the part of the main core program which deals with interaction of the protagonists and language analysis is being considerably extended. This is essential so that you, as Sherlock Holmes, can discuss your ideas with Lastrade and interrogate possible suspects.

Sherlock Holmes will have fewer locations than *The Hobbit* but with many more objects and people to meet who will be able to give evidence.

At this stage it is not clear if the program will have room for any graphics — memory limitations are Philip's main problem.

"It is very frustrating at times. One of the advantages of writing on the TRS80 is that I can write the program and compress it down later.

"As each new part of the program is incorporated into the main game it is rewritten several times and in the process the routine is refined."

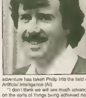
Philip writes first in source code using an off-the-shell editor/assembler package for the TRS-80. *Sherlock Holmes* is now about 10 times the size of the Spectrum's memory, but when that is compiled into machine-code with a lot of squeezing it should just fit.

Until now Philip has been working mainly on the personalities of Lastrade and Watson. "In some ways Watson is an equivalent of Thorin in *The Hobbit*. But Thorin was a pretty static character — apart from singing about gold there wasn't much to him. Watson will be much more complex."

Much of the inspiration for the programming of the Dr Watson character comes from the famous *Eliza* program. Watson reacts to everything that is said to him — reforming what you have said into a question or coupling what has been said in a sentence together with something that has been said before.

In regard of the Lastrade character, Philip says: "I haven't decided if he will remain in his office or wander about the game. If I let him roam free then, before you could ask him questions, you would have to first find him."

Trying to enhance the level of communication between characters in the new



adventure has taken Philip into the field of Artificial Intelligence (AI).

"I don't think we will see much advance on the sorts of things being achieved now in 8-bit micros. There is just not enough memory, and for AI the processors are too slow.

"When we have 16-bit machines with half a megabyte of memory, then there will be a lot more scope for AI in adventure games. I am currently working with the 68000 processor in my spare time and watching and hoping.

"In my opinion it is the easiest 16-bit chip to program and certainly the most powerful. The reason for this is that its main instruction sequence was designed by a programmer and not an engineer.

"If someone was to produce a micro based around the 68000, designed primarily for speed and high-resolution graphics, then I think we would see some amazing games produced."

At present, adventuring seems to be splitting into two schools. From *The Hobbit*'s mixture of text and graphics things are either moving towards all-graphic games with some animation, or more complex adventures with advanced text handling and language interpretation, but no graphics.

"When the 16-bit machines with more memory come," says Philip, "the two strands may converge again to produce a truely interactive game."

His deadline for *Sherlock Holmes* is January, when it is hoped to launch the new game for both the Spectrum and Commodore 64 machines.

He is not looking forward to converting the program for the Commodore 64. "Converting *The Hobbit* was a horrible job — I'm not as comfortable with that machine because in my view the 6502 is an inferior processor to the Z80.

"The processor is older with a very simple instruction set — what takes one or two instructions on the Z80 takes four or five on the 6502 — it's very frustrating."

If all goes well both versions of *Sherlock* should be available by the end of January. "If the final game adventure lives up to my claims, then I hope we will have another winner," Philip says. ■

Never say die

***Mike Graca** battles with a mini-kong in his latest review of Vic20 software*

One of the tears of micro computer owners must be the disappearance of either the hardware or more significantly I suspect, the software The computer world is notorious for fortunes that are made and lost in the twinkling of a line feed (you only have to watch the cover of *Popular Computing Weekly* to see that), and even an investment of £100 can be pretty tiresome if there s nothing to play with or use in the way of software So — I thought to myself the other day — how about my slightly battered but lovable Vic?

Earlier this year, Commodore held an exhibition You may have heard about it, you might even have gone along as I did And one of the things that struck me as I jostled through the crowds was the amount of software for the Vic20 which seems to be growing and growing Even if Commodore does stop production (as I ve seen suggested in the press) it seems we owners have no fear of software drying up

Jupiter Defender from Interceptor Micros for the unexpanded Vic is our old friend *Defender* Described in the blurb as an invaders program written in machine code with high resolution graphics It certainly is fast, with lots of noises and action as the familiar ship skims along the planet surface — but graphics? Very elementary and amateur

This brings up a point — just how much do graphics really matter? I tend to judge a game by its graphic quality and its presentation — but not so my nine-year-old son To him ease of use and 'zapability' are more important and he tends to pick *Jupiter Defender* The ship (poorly drawn but who cares) skims along with aliens blobs, evil-looking ovals and fiendish red spots all trying to annihilate it as it fires at will bumping up the score Listening to his cries of delight and achievement on getting a higher score or just getting through the deadly hail of red dervishes makes me realise that not all games appeal to all people Well why should they? *Jupiter Defender* isn t for me but as this style of game goes it is obviously addictive and more than adequate

I'd give this game a score of six (out of 10) because it does appeal to the younger audience so well An interesting additional feature is the ability to destroy everything on the screen by using a smart bomb (that means you press any key and all the baddies on the screen are destroyed giving you a few moments respite) Packaging and instructions are adequate Great fun for younger players

Next let s look at another game for the unexpanded Vic Anirog produced a 16K version of *Krazy Kong* which I reviewed some time ago but now they ve compressed their game into a *Mini-Kong* package for the 3 5K configuration incorporating the first screen of the 16K version only The graphics are virtually identical to the original, with the same little man wearing a striped jersey (his girlfriend looks exactly the same except her jersey has different colours) trying to dodge the barrels and get up to Kong

One of the problems with this game is the difficulty — it really is hard Trying to jump on the lift involves extreme delicacy of touch as if you press the joystick too hard you splat whilst dodging the barrels from above These barrels come down with incredible speed (without Kong doing much it appears) and to be honest the task seems nigh impossible

Anirog always have excellent displays including a clock ticking away the seconds, your score and your lives Kong tends to look like a slightly constipated gorilla but the lift and the ladders look very good

This is an excellent version for the player who hasn t expanded his machine yet and it amazes me how so much is squeezed into that tiny bit of memory You ve got an expanded screen, a lift and a handbag bonus (there s something slightly odd about this Kong thing I ve decided) as well as a high score table And all this for £5 95

Next I turned to something called *Slap Dab* which is based on an arcade game called *Painter* I am definitely not an arcade fan so I *Loaded* this without any idea of what was to come except that the advertisements had talked about fast action strategy and giant insects Sounded good!

On *Loading* I skimmed the instructions (a spelling mistake and rather poorly displayed text made a bad first impression) but as soon as the game started I found it both delightful and (a vital point for a slow player like myself) easy to play The essence of the game is that you have control of a little man who moves across the screen, painting in the background white as he goes At intervals his pot of paint runs out and he has to return to base to refill but there are one or two nasty insects (who seem to look just like our hero) who have to try and zap you Strategy is involved as well as speed as you can trap the insects (they can only move on painted areas while you can move anywhere) and the game isn t too hard at the first level of play

At £5 95 this seems good value and I wanted to play this just for fun after I'd finished the review When you start the insects move fairly slowly but as you progress through the levels of skill the baddies get quicker and (it seems) smarter I found the response to the joystick excellent and the graphics adequate The sound effects enhanced the game but I did find that at times zappy noises were happening and I wasn t sure quite why or what misfortune was about to befall me The concept of the game was new to me and I liked it

Now we move on to the 16K games, the first of which is *3D Time Trek* and is modestly priced at £6 00 for what is an enjoyable and visually stunning combination of *Star Wars* and *Star Trek* The cover shows a dramatic science-fiction scene of three men aboard their star ship watching a star go nova or an alien ship exploding (presumably the latter) This represents the feel of the game exactly once you start playing

You are faced with a beautiful blue background and a realistic console with perspective drawn in (hence the 3D of the title) so that it really looks like the bridge of the *Enterprise* The centre of the screen contains a monitor which will display either instructions (in enhanced lettering to better the visuals) or a view of space outside your ship (this becomes very exciting once you engage the enemy) Various keys give you the usual display of galaxy map long-range scan damage report, etc My review copy contained inadequate information on the cassette sleeve as to which key to press (a printing error I presume, but if you get one of these

duff covers press 'M' to obtain the galaxy map).

What sets this game apart from the other versions of *Star Trek* I have seen is that once you engage the enemy instead of an unseen battle taking place you actually move into real-time visuals. On the centre monitor a tiny dot appears, enlarges into a cross, and finally into a head-on view of an alien ship.

As it comes closer it moves across the screen dodging and weaving — because you are equipped with a joystick (of course) and must fire as soon as the alien hits the exact centre of the screen to blast him into smithereens. Amidst flying debris and explosive sound effects, you are now able to move on to the next segment in space.

I found the game extremely enjoyable, perhaps not quite as intellectually satisfying as some other versions of *Star Trek* but much more fun. As with many other Anirog cassettes I was really taken with the graphics, and at first I actually thought I'd have a chance of winning. But as I sit here firing madly at the approaching aliens, I'm losing energy — fast — and then the blighters damage the shields and — lost again!! It would be nice to win through just once in a while... Still, at £6.00 — who can complain!

Galactic Abductors is another 16K game with a science-fiction theme, priced at £7.90. This time deadly space hawks (stunning graphics, or as Jeff Minter might say — awesome!) come winging over the horizon to wreak havoc on your planet of little matchstick men. All you control is a laser gun, patrolling along the bottom of the screen. Your gun can fire upwards and sideways (a neat trick this, involving pulling the joystick back and to the left or right prior to pressing the fire button) and the hawks swoop down and flap quite eerily across the stark black alien sky (dotted with a few stars which really do twinkle).

It seems the hawks have a burning desire for people, for they will carry off your matchstick men if you don't stop them and, if you cannot fire and kill them in time, then just a skull falls to the ground (I'd hate to think what happened to the matchstick man). However, just to keep you on your toes, the hawks also drop little 'homing mines' which fall to the ground and come sidling along the flat towards you.



The game is both fast and enjoyable, although I seemed to find it impossible to destroy any of the hawks by firing at them, they just changed colour. What did impress me was that after the preliminary wave of hawks they would all disappear and the screen would go very quiet. It seemed as if we were waiting for something terrible to happen. Sure enough, after a few tense moments, the hawks reappeared from behind the mountains to attack again — with a menacing swooshing noise that started quietly and built to a crescendo. Good atmospheric stuff! Another winner from Anirog.

Now, just in case you think I can't say anything against this company, I have to confess I do not like their next game *Zok's Kingdom*. Billed as a graphic adventure, this is really a visual attempt at setting a lot of puzzles for our little stick man inside a number of rectangles (called rooms). The game is for the expanded Vic (16K) and costs £5.95. It has a terrific title with dramatic lettering, sound effects, and a castle with bats fluttering in the sky, but when it comes to the actual game — for me it doesn't deliver the goods.

After the title there is a page of text explaining you have crashed on a planet belonging to a relative of Dracula, a chap by the name of Zok! Now you have to enter his Kingdom if you dare. Presumably you do, having just paid out your money.

The rule in any adventure is to pick up objects, and in this type of game it's the same. One of the problems is that quite often you won't know what the object is, as all you see is a square or oblong shape which disappears once you manipulate the little man beside it — but you pick up just the same. Having said that — take care as one of the objects somewhere inside the castle is a box which electrocutes you without any warning. Once into the castle proper, you must manoeuvre past a nasty looking guardian called Dagon. Having done that, you now move along picking up various keys to allow you to enter rooms.

It's all quite amusing, but I didn't find it stimulating at all (unlike text adventures). I also found the necessity to keep going back and forth along endless corridors and mazes a trifle tiresome.

As I often do I've saved the best game till last. *Matrix* by Jeff Minter of Llamasoft has to be my favourite of the batch. For the 16K expanded Vic and priced at £6.00 this is a zap, pow, shoot 'em quick, style of rapid 'What the heck is going on' type of game that has just caught my fancy. Graphics are very good, and the noises are splendiferous.

It seems that some nasty aliens are back with a vengence to get us, and we have the obligatory spaceship with lots of firepower to try and get us out of the mess. In fact there's a whole heap of history in the instructions about it being ten years since the grid wars and you're called to base because the droids are back, etc, etc, but that is all a bit above my head. What I do like is the action, and the fun.

Once you get into the game (after a neat title sequence) a terrific red grid appears on the screen and baddies start appearing all over the place looking like snakes, ships, saucers, whatever. I just shot about firing like the future of the earth depended on it and at times they got me and at times I got them, but it was all so fast I never really quite knew where I was. One exceptionally useful facility is that you can pause the action — and return to the game later.

You start with five lives, and when you win you get an extra life (nice that!). Another feature I liked was that if you cleared a zone and moved to the next and then lost a life, you didn't automatically go right back to the beginning again as many other games do — you just started again in the higher zone. There are 20 skill levels (for real players) and plenty of weird and wonderful effects like the Zappers and the dreaded Y beam to enhance play. This is a smashing game, lots of fun, and my pick of the review.

Finally, for those of you with long memories I ought to say that in my last review I left Anirog's game *Xeno II* only partly reviewed as I hadn't mastered more than level 1. I can report that I've now got into level 2, but once again it's so hard I can't get any further. Watch this column for more news next time. ■

Firm	Program	Cost	Value (1-10)
Anirog 26 Balcombe Gardens Horley Surrey	*Galactic Abductors*	£7.90	8
	3D Time Trek	£6.00	8
	Zok's Kingdom	£5.95	5
	Mini Kong	£5.95	7
	Slap Dab	£5.95	7
Interceptor Lindon House The Green Tadley Hants	*Jupiter Defender*	£6.00	8
Llamasoft 49 Mount Pleasant Tadley Hants	*Matrix*	£6.00	10*

Modified functions

***Clive Newton** explains how to redefine the Lynx keyboard to your own requirements*

The Lynx Micro has several attractive features but one of the most useful must be that of being able to modify the machine s functions by altering addresses or variables in the system table area

The accompanying program allows Lynx users to define their own single key entry command set (see page 80 of the manual) This is made possible by altering the values of the system variables at locations 25146 to 25171 which represent the commands associated with the keys *A* to *Z* The value at each location represents the command token which is the position minus one of the Basic command in the Basic syntax command table

The program, when Run constantly displays the single key set up (on the keys *A* to *Z*) on the top two thirds of the screen The bottom part of the screen is responsible for displaying the menu or the sequence of operations once a menu option is selected The menu gives the user a choice of four options

(1) Alter the table set-up
(2) Reset the table
(3) Save the modified table or
(4) Exit from the program

Selecting the first of these the user is asked to input the key (*A Z*) that is required to be altered (the program will return to the menu if an invalid input is entered) The user is then prompted for the new command to be associated with the previously defined key All command inputs are checked for validity The program then updates the system variable associated with that key with the correct command token

You will notice that the standard single key entries are printed on the screen in yellow and any modified commands are printed in red Exit from this option is achieved by pressing any other key apart from *Y* when asked whether further updating is required

The second option resets the computer with the standard command set that the user has on switching on the machine This is done by copying the table that is held in the Rom from location 5985 onwards While the machine is resetting the table an arrow will flash next to the reset option on the menu, and will disappear once that option has been completed Once the program has been cleared from memory the standard command set can be reset by using the command *Call 1* which is easier than pulling the power plug

The next option will save the 26 bytes representing the modified command set by using the *Save* routine in the Rom utilised by the monitor (ie in connection with the *D* option) The table will be *Saved* using a program name of *Tablen* where *n* is the version number you specify on entering the routine, ie if you specify version 0 then the program name will be *Table0* This program name is printed on the screen once the computer is ready to start saving The tape recorder can be switched off once the bottom part of the screen starts clearing

Now using this saved command set, you can easily re-enter it by using the command *Mload* eg *Mload "TABLE0"*

The final option (exit program) will reset the text window back to the full screen size whereupon the screen will clear as will the program but your modified command set will remain until you reset the machine

Looking at the program listing you will notice that there are four machine code routines held in the *Code* statement lines 700 to 730 inclusive They are called using the command *Call Lctn* (line number) and each routine s function is as follows

Line 700 — Copies the 75 commands from the BASIC Syntax table in the ROM to the appropriately dimension array A$ This is done to simplify table output and also to do away with data statements
Line 710 — Once you have chosen the command you wish a key to be modified to this routine will check its validity and will return the respective command token in HL
Line 720 — This routine is responsible for clearing the bottom third of the screen and resetting the cursor position in the correct place
Line 730 — Responsible for saving the modified Command Set, with the correct program name

The program revolves around the very useful facility in Lynx Basic, of being able to pass parameters to declared procedures — the main procedures being those of *Ink* and *Alter* *Ink* works out the correct colour the command should be printed on the screen ie either yellow or red *Alter* is responsible for modifying the appropriate system variable and also prints the new command in the correct colour and position on the screen

The character in lines 75 and 685 (underscore) is that representing *Ascii 95* and can be accessed on the Lynx keyboard by going into graphics mode and using *Shift?* For line 670 I printed Lynx using the defined characters in the graphics set ((*Shift*) *STUVXY*)

Finally for those of you who have disassembled the machine code routines in this program you will come across several system variables whose function you probably will not understand as they were not documented at all in the Lynx manual

25145 — The state of the keyboard (SHIFT LOCK on or off or whether you are in graphics mode) Poking this with the value zero (line 50) forces upper case (i e SHIFT LOCK on)
25172 — Horizontal print position
25173 — Vertical print position
25113/4 — Address of the start of the BASIC Command Syntax Table (ROM)
25984/5 — Address of the end of BASIC program ■

```
10 DIM A$(7)(75)
20 CALL LCTN(700)
30 WINDOW 15,110,25,245
40 VDU 1,WHITE,2,BLACK,4
50 POKE 25145,0
60 PROC HEADER
70 PROC TABLE
75 PRINT 'Commands!   1. Alter Table
',,'_________    2. Reset Table',,,'
3. Save New Table',,,'4. Exit'
80 LET K=GETN-47
90 IF K<2 OR K>4 THEN GOTO 80
100 ELSE GOTO K*100
110 CALL LCTN(720)
120 GOTO75
200 REPEAT
205   CALL LCTN(720)
210   PRINT 'Change which letter ';
220   LET L=GETN
230   IF L<ASC('A') AND L>ASC('Z')
THEN RETURN
240   PRINT CHR$(L)
250   INPUT 'New Command ';B$
260   CALL LCTN(710)
270   IF HL=75 THEN PRINT CHR$(7),,
'Invalid Command'
280   ELSE PROC ALTER (L-65,HL)
285   PRINT @ 15,215;'Continue ? <Y/
N>'
290 UNTIL NOT GET$='Y'
300 FOR I=0 TO 25
310   PRINT @ 43,195;CHR$(1);CHR$(I+
7);CHR$(123);
320   POKE 25146+I,PEEK(5985+I)
330   PROC ALTER (I,PEEK(5985+I))
340 NEXT I
```

```
350 GOTO 80
370 DEFPROC INK (x)
380 LET ı=2+4*(PEEK(5985+x)=PEEK(251
46+x))
390 ENDPROC
400 CALL LCTN(720)
410 PRINT "Version Number <0 TO 9> ?"
420 LET V=GETN
430 IF V<48 OR V>57 THEN GOTO 420
440 POKE LCTN(730)+24,V
445 DPOKE LCTN(20)+13,LCTN(730)+18
450 PRINT CHR$(10);"Start Tape and
Press Any Key","TABLE";CHR$(V)
460 LET V=GETN
470 CALL LCTN(730)
480 GOTO 110
500 WINDOW 3,123,5,245
510 CLS
520 NEW
550 DEFPROC ALTER (t,X)
560 POKE 25146+t,X
570 PROC INK (t)
575 PRINT @ 15+(INT(t/13)*48),39+(t-
(t>12)*13)*10;CHR$(20);CHR$(1);CHR$
(1);CHR$(65+t),A$(X)
576 VDU I,WHITE
580 ENDPROC
600 DEFPROC TABLE
610 FOR I=0 TO 13
620   PROC ALTER (I,PEEK(25146+I))
630   PROC ALTER (I+13,PEEK(25159+I))
640 NEXT I
645 DPOKE 25172,&B90F
650 ENDPROC
660 DEFPROC HEADER
670 PRINT CHR$(21);"LYNX SINGLE KEY
ENTRY TABLE"
680 VDU 28,20
685 PRINT "------------------------
-----"
690 ENDPROC
700 CODE ED 5B 19 62 13 2A FC 61 23
06 4B 0E 07 1A 23 CB BF 77 13 23 1A
CB 7F 20 07 0D 18 F5 3E 20 77 23 0D
20 F9 3E 0D 77 23 10 E2 C9
710 CODE 2A 19 62 06 4B 23 CB 7E 2B
FB ED 5B FC 61 C5 01 AE 02 EB 09 EB
C1 E5 1A FE 0D 28 0B 4E CB B9 23 13
91 2B F3 E1 1B 06 4E CB 79 E1 20 02
10 D6 3E 4B 90 26 00 6F C9
720 CODE 3E 14 CF 21 0F B9 22 54 62
06 04 3E 1E CF 3E 1F CF 10 F8 22 54
62 C9
730 CODE 21 3A 62 E5 21 53 62 E5 21
00 00 E5 11 2A 73 C3 03 3F 22 54 41
42 4C 45 31 22 C9
```

Keep the flag flying

***David Bark** looks inside the Z80 chip to see the various flags in action*

This program uses a simple 135 byte long machine code routine from address 32100 to 32135 to store all the Z80 register values into addresses 32000 to 32021. A block of 20 bytes, from 32152 to 32171, is reserved in the middle of the routine for single commands or a short routine to be inserted and tested. Any of these bytes not used are filled by zeroes.

The register values are then *Peeked* by the Basic program and displayed on screen. The flags register has the individual flags shown as flashing when set or steady when reset.

All commands or numeric values must be entered in hex or decimal. There are some commands which will crash or lock-up the program if used carelessly. *Pushes* and *Pops* must be equalised so that the *SP* is returned to its original value. Exchange instructions must similarly be equalised and for some reason the alternate registers may not be altered or the program locks up.

No doubt there are many other commands or routines which will cause similar problems. *JP* and *JR* instructions may be used but must be kept within the 20 byte limitation.

Despite these restrictions, the program has proved to be very instructive when trying to understand exactly what is going on inside that infamous Z80 chip. The reactions of the various flags can now, at last, be seen in action!

Part of the main program is a hex loader (lines 1610 to 1710), so these lines can be modified to type in the hex listing and then altered to fit into the main program. If you have a hex loader on cassette, *Load* it from address 32100, if not type in listing 1 and *Run* it to enter the hex codes in listing 2. The codes should be entered one complete line (8 bytes) at a time, ie, the first line would be entered as *'ED4B007DC5F1ED4B' Enter'* which will give you a neatly laid out screen display exactly matching the list for easy checking.

If you find an error, simply make a note of the address at which it occurs and the correct entry, and carry on. Type *S* to finish and then look up the decimal values of any errors and *Poke* them in as direct commands at the end.

Once the hex is in, alter the hex loader by referring to listing 3. Remember to enter line 1655 and then type in the main program from listing 4, ignoring lines 1610 to 1710 which you already have.

Now enter *Goto 5000* and *Save* and *Verify* the program. Remember that you will have to "Press any key twice once for the Basic and again for the machine code.

Enter *Goto 10* (if loaded from tape the program will auto run) and wait 15 seconds or so while the UDGs are formed and the *Peeks* and *Pokes* are carried out.

The display, when it arrives, will show the zero, half-carry and parity/overflow flags as flashing (set) and the rest in the primary set, as static (reset). The two unused flags (bits 3 and 5) are not marked, but will flash if they become set for some reason.

You are asked to select *D* for decimal entries or *H* for hex entries. Remember to engage *Caps Lock* for hex entries. Decimal entries must be entered one at a time and ended with *999* — hex entries may be entered in blocks and ended with *S*. Do not use *Ret (201d, C9h)* in your routines or you will pop out of the machine code with some odd results.

To start your experiments, you may want to zero all the primary registers — a routine to do this is built in. Select *H* and then enter *Z*. After the usual pause the screen will display all the registers as empty with the flags reset.

You now have a clean sheet to work on. Try a few additions and subtractions to start with. Notice that *Loading* the accumulator with a negative number (ie, a number between 128 and 255 inclusive) does not affect the flags but as soon as you carry out a mathematical operation, even adding or subtracting zero, the flags are affected.

Although the stack pointer must be returned to its original value before the end of your test routines, its behaviour can be examined by *Loading HL* with zero and adding *HL SP*. Try the following routine after zeroing the registers:

```
210000  Ld HL,
F5      Push AF
39      Add HL,SP
F1      Pop AF
```

Now you will see that *HL* contains the value *31974*, demonstrating how the stack grows downwards, like a stalactite.

You might find it useful to make a note of the binary values of the register(s) you are working on before you carry out your routine, to compare with the values after. Try the shift and rotate commands, some of them contain a surprise or two. Then see what happens when you *AND*, *OR* and *XOR* two numbers (do they have a practical value?)

I hope this program helps you to unravel some of the hidden secrets of the Z80. ■

Listing 1

```
1600 REM LISTING 1
1610 CLEAR 31999
1620 LET n=32100
1630 LET z$=""
1640 IF z$="" THEN INPUT "Enter your Hex code now",z$: PRINT n,
1650 IF z$="S" THEN STOP
1660 LET s$=z$(1 TO 2): LET z$=z$(3 TO ): PRINT s$,
1670 LET x1=CODE s$(1)-48: IF CODE s$(1)>57 THEN LET x1=x1-7
1680 LET x2=CODE s$(2)-48: IF CODE s$(2)>57 THEN LET x2=x2-7
1690 LET x=16*x1+x2
1700 POKE n,x: LET n=n+1
1710 GO TO 1640
```

Listing 2

```
              HEX LISTING
32100   ED 4B 00 7D C5 F1 ED 4B
32108   02 7D ED 5B 04 7D ED 6B
32116   06 7D 08 D9 ED 4B 08 7D
32124   C5 F1 ED 4B 0A 7D ED 5B
32132   0C 7D ED 6B 0E 7D 08 D9
32140   DD 2A 10 7D FD 2A 12 7D
32148   ED 7B 14 7D 00 00 00 00
32156   00 00 00 00 00 00 00 00
32164   00 00 00 00 00 00 00 00
32172   ED 43 02 7D F5 C1 ED 43
32180   00 7D ED 53 04 7D ED 63
32188   06 7D 08 D9 ED 43 0A 7D
32196   F5 C1 ED 43 08 7D ED 53
32204   0C 7D ED 63 0E 7D 08 D9
32212   DD E5 C1 ED 43 10 7D FD
32220   E5 C1 ED 43 12 7D 21 00
32228   00 39 ED 63 14 7D ED 4B
32236   02 7D ED 6B 06 7D C9 00
```

Listing 3

```
1600 REM LISTING 3
1610 PRINT AT 16,26; PAPER 7; INK 0; "(TE) ";AT 17,26; "LEFT"
1620 PRINT AT 18,26; PAPER 7; INK 0; "  ";AT 18,27;z
1630 REM Add: LET n=32512
1640 REM Delete: PRINT n,
1650 REM Alter: THEN STOP to THEN LET n=n-32152: GO TO 1490
1655 IF z$="Z" THEN GO SUB 3000
1660 REM Delete: PRINT s$ and add: PRINT AT w,p;"\s";" ";: LET p=p+3: IF p>27 THEN LET w=w+1: LET p=0
1670 REM No Change
1680 REM No Change
1690 REM No Change
1700 REM Add: LET z=z-1: PRINT AT 18,26; PAPER 7; INK 0;AT 18,27;z: IF z=0 THEN GO TO 2000
1710 REM No Change
```

```
   5 CLEAR 31999 LOAD "" CODE
32000,300
  10 RESTORE 200
  20 FOR n=144 TO 146
  30 FOR a=0 TO 7
  40 READ d  POKE USR (CHR$ n)+a
,d
  50 NEXT a
  60 NEXT n
  70 LET g$="▯▯▯▯▯▯▯▯"   LET a=3
2000
  80 DIM b$(22,8)   DIM b(22)
  90 RANDOMIZE USR 32172  GO TO
600
 200 DATA 256,128,128,128,128,12
8,128,256
 210 DATA 128,128,128,128,128,12
8,128,128
 220 DATA 128,128,128,158,128,15
8,128,128
 500 LET a=32002
 510 FOR n=1 TO 22
 520 LET b(n)=PEEK (a+n-1)
 530 LET x=128  LET b1=b(n)
 540 FOR a=1 TO 8
 550 LET b2=INT (b1/x)  LET b$(n
,a)=STR$ b2  LET b1=b1-(b2*x)  L
ET x=x/2
 560 IF b$(n,a)="1" AND n<>1 AND
n<>9 THEN LET b$(n,a)="█"
 570 IF b$(n,a)="0" AND n<>1 AND
n<>9 THEN LET b$(n,a)=" "
 580 NEXT a
 590 NEXT n
 600 LET BC=PEEK 32002+256*PEEK
32003
 610 LET DE=PEEK 32004+256*PEEK
32005
 620 LET HL=PEEK 32006+256*PEEK
32007
 630 LET SX=PEEK 32010+256*PEEK
32011
 640 LET DX=PEEK 32013+256*PEEK
32012
 650 LET HX=PEEK 32014+256*PEEK
32015
 660 LET IX=PEEK 32016+256*PEEK
32017
 670 LET IY=PEEK 32018+256*PEEK
32019
 680 LET SP=PEEK 32020+256*PEEK
32021
1000 BORDER 1  PAPER 1  INK 7  C
LS
1005 LET f$="SZ H PNC"
1010 PRINT AT 0,9,"Z80 REGISTERS
"
1020 PRINT AT 2,0,"A  ",b$(2),TAB
 11,"    ",TAB 16,"F  ";  FOR n=1
TO 8  PRINT FLASH (VAL b$(1,n));
f$(n);  NEXT n
1030 PRINT AT 2,2, OVER 1,g$,TAB
 11,b(2)
1040 PRINT AT 3,0,"B  ",b$(4),TAB
 11,"   ",TAB 16,"C  ",b$(3),TAB
27,
1050 PRINT AT 3,2, OVER 1,g$,TAB
 11,b(4),AT 3,18, OVER 1,g$;TAB
27,b(3)
1060 PRINT AT 4,0,"D  ",b$(6),TAB
 11,"   ",TAB 16,"E  ",b$(5),TAB
27,"  "
1070 PRINT AT 4,2, OVER 1,g$,TAB
 11,b(6),AT 4,18, OVER 1,g$,TAB
27,b(5)
1080 PRINT AT 5,0,"H  ",b$(8),TAB
 11,"   ",TAB 16,"L  ",b$(7),"
"
1090 PRINT AT 5,2, OVER 1,g$,TAB
 11,b(8),AT 5,18, OVER 1,g$,TAB
27,b(7)
1100 PRINT AT 9,0,"A' ",b$(10),TA
B 11,"  ",TAB 16,"F' ";  FOR N=1
 TO 8  PRINT FLASH (VAL b$(9,n))
f$(n);  NEXT n
1110 PRINT AT 9,2, OVER 1,g$,TAB
 11,b(10)
1120 PRINT AT 10,0,"B' ",b$(12),T
AB 11,"   ",TAB 16,"C' ",b$(11),"
"
1130 PRINT AT 10,2, OVER 1,g$,TA
B 11,b(12),AT 10,18, OVER 1,g$,T
AB 27,b(11)
1140 PRINT AT 11,0,"D' ",b$(14),T
AB 11,"   ",TAB 16,"E' ",b$(13),"
"
1150 PRINT AT 11,2, OVER 1,g$,TA
B 11,b(14),AT 11,18, OVER 1,g$,T
AB 27,b(13)
1160 PRINT AT 12,0,"H' ",b$(16),T
AB 11,"   ",TAB 16,"L' ",b$(15),T
AB 27,
1170 PRINT AT 12,2, OVER 1,g$,TA
B 11,b(16),AT 12,18, OVER 1,g$,T
AB 27,b(15)
1180 PRINT AT 16,0,"IX",b$(18),T
AB 11,b$(17)
1190 PRINT AT 16,2, OVER 1,g$,AT
 16,11, OVER 1,g$
1200 PRINT AT 17,0,"IY ",b$(20),T
AB 11,b$(19)
1210 PRINT AT 17,2, OVER 1,g$,AT
 17,11, OVER 1,g$
1220 PRINT AT 18,0,"SP",b$(22),T
AB 11,b$(21)
1230 PRINT AT 18,2, OVER 1,g$,AT
 18,11, OVER 1,g$
1240 PRINT AT 7,1,"BC = ";BC,TAB
11,"DE = ";DE,TAB 22,"HL = ";HL
1250 PRINT AT 14,1,"BC'=",BX,TAB
 11,"DE'=",DX,TAB 22,"HL'=",HX
1260 PRINT AT 16,20,IX,AT 17,20,
IY,AT 18,20,SP
1300 PRINT AT 20,0,"You must ent
er your m/c command or routine i
n Decimal or Hex"
1310 INPUT "Dec(D) or Hex (H)?",
z$  IF z$="s" OR z$="S" THEN STO
P
1320 LET z=20  LET w=19  LET p=0
  PRINT AT 20,0,"
1330 IF z$="d" OR z$="D" THEN GO
 TO 1400
1340 IF z$="h" OR z$="H" THEN GO
 TO 1600
1350 GO TO 1300
1410 PRINT AT 16,26, PAPER 7, IN
K 0,"BYTES",AT 17,26,"LEFT "
1420 PRINT AT 18,26, PAPER 7, IN
K 0,"   ",AT 18,27,z
1430 FOR n=0 TO 20
1440 INPUT "Enter your decimal c
ode now",q
1450 IF q=999 THEN GO TO 1490
1460 IF p>28 THEN LET p=0  LET w
=w+1
1470 POKE (32152+n),q  PRINT AT
w,p,q,"/"  LET p=p+3  LET z=z-1
  PRINT AT 18,26, PAPER 7, INK 0,
"   ",AT 18,27,z
1480 NEXT n  GO TO 2000
1490 FOR m=(32152+n) TO 32171  P
OKE m,0  NEXT m  GO TO 2000
1610 PRINT AT 16,26, PAPER 7, IN
K 0,"BYTES",AT 17,26,"LEFT "
1620 PRINT AT 18,26, PAPER 7, IN
K 0,"   ",AT 18,27,z
1630 LET z$=""  LET n=32152
1640 IF z$="" THEN INPUT "Enter
your Hex code now",z$
1650 IF z$="S" THEN LET n=n-3215
2  GO TO 1400
1655 IF z$="Z" THEN GO SUB 3000
1660 LET x$=z$(1 TO 2)  LET z$=z
$(3 TO )  PRINT AT w,p,x$,"/"  L
ET p=p+3  IF p>27 THEN LET w=w+1
  LET p=0
1670 LET x1=CODE x$(1)-48  IF CO
DE x$(1)>57 THEN LET x1=x1-7
1680 LET x2=CODE x$(2)-48  IF CO
DE x$(2)>57 THEN LET x2=x2-7
1690 LET x=16*x1+x2
1700 POKE n,x  LET n=n+1  LET z=
z-1  PRINT AT 18,26, PAPER 7, IN
K 0,"   ",AT 18,27, PAPER 7, I
NK 0,z  IF z=0 THEN GO TO 2000
1710 GO TO 1640
2000 RANDOMIZE USR 32100
2010 GO TO 500
2999 STOP
3000 LET z$="21000011000021000C
BF15"
3010 RETURN
5000 CLS  SAVE "Z80" LINE 5  SA
VE "Z80"CODE 32000,300
5010 INPUT "Rewind tape and chan
ge plugs,  Press 'ENTER' to Ver
ify",z$
5020 VERIFY "Z80"  VERIFY "Z80"C
ODE 32000,300
```

```
               Z80 REGISTERS
A ████████ =172   F SZ H PNC
B ████████ =125   C ████████ =172
D ████████ =114   E ████████ =140
H ████████ =45    L ████████ =43

  BC =32172 DE =29324  HL =11563

A ████████ =126   F'SZ H PNC
B ████████ =22    C ████████ =33
D ████████ =54    E ████████ =155
H ████████ =39    L ████████ =85

  BC =5... DE =39724   HL =10072

IX████████-████████ 32500
IY████████-████████ =23510
SP████████-████████ =31976
You must enter your m/c command
or routine in Decimal or Hex
```



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Scale and perspective

***Michael Batty** explains how to put things into perspective in the first of a three-part series*

The great challenge of computer graphics is to realistically represent three dimensional objects on a two-dimensional screen opening the way to computer-aided design sophisticated computer art and even computer movies

There are two key issues First, there is the geometry of such problems which although tricky, is quite standard and thus easy to program Second, there is the much more difficult question of realism, which involves removing hidden lines, colouring objects and suchlike

Any object for example the house we will present here, is usually represented in three dimensions by points defined in its world co-ordinates *x, y, z* which can be transformed to two-dimensional screen co-ordinates *x y* To generate perspective, the object must be seen from a viewpoint and the transformations made with respect to the distance between viewpoint screen and the object itself These transformations involve various movements of the object and/or co-ordinate system through the standard operations of translation, rotation and reflection. The procedure we have programmed here can be found in most books on computer graphics for example Myers *Microcomputer Graphics* (Addison-Wesley, 1982)

Figure 1 shows the transformation of the three-dimensional object to two-dimensions in terms of its viewpoint and screen The object is located in Cartesian co-ordinates *x, y, z* but it is easier to measure the viewpoint using polar co-ordinates *RHO* is the distance from view-point to the origin of the object s co-ordinate system *PH* the angle the view-point line makes with the vertical *z* axis (note that 90° is ground level) and *TH* is the angle of horizontal rotation A fourth parameter *DIS* is the distance of the viewpoint from the screen These four parameters entirely control the perspective and size of the object as it will appear on the screen

The object is coded in terms of its point co-ordinates *x, y, z* but its outline is given in terms of the planes that make up its form Each plane consists of points arranged in the order they are linked The object is plotted by plotting each plane and although this involves duplication it is the most efficient way for simple objects with a small number of planes The program first reads in the world co-ordinates and planes from data statements and then requests the user to supply the viewpoint parameters *RHO, DIS, TH* and *PH* The trig functions are calculated in *Procsetup* the transformations made in *Proctrans* and the object s planes plotted in *Procframe*

The wire frame diagram which results, and is shown in figure 2 is plagued by optical illusions But after a little experience with typical viewpoint parameters, the program is useful to explore the effect of scale and perspective As the house is roughly a cube with each side 400 units start with the viewpoint distance as 1000 and the screen distance half this Then explore these effects by changing all the parameters Go near to the house and watch it explode off the screen all around you Go inside it and go above it There are hundreds of possibilities

Next week we will tackle the problem of realism by showing how you can remove hidden lines and make the house solid ■

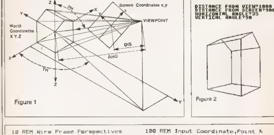
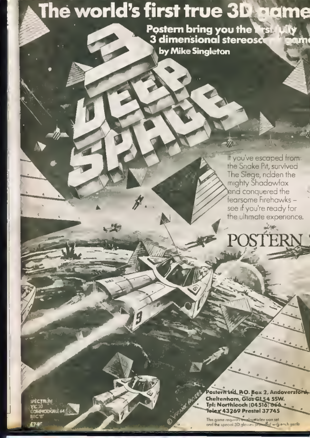


Figure 1

Figure 2

```
10 REM Wire Frame Perspectives
20 REM (c)Michael Batty,
   October,1983
30 MODE1
40 DIM W(10,3),S(10,2),P%(7,5),
   NP%(7)
50 VDU19,0,2;0;19,1,4;0;19,2,0;0;
60 VDU28,0,5,39,0:VDU24,0;0;1279;
   830;
70 N%=10:M%=7:VDU29,640;400;
80 COLOUR 128:GCOL0,129
90 CLS:CLG:COLOUR 2
100 REM Input Coordinate,Point &
     Plane Data
110 FOR I%=1 TO N%
120   READ W(I%,1),W(I%,2),W(I%,3)
130   NEXT I%
140 FOR I%=1 TO M%
150   READ NP%(I%):NEXT I%
160 FOR I%=1 TO M%
170   FOR J%=1 TO NP%(I%)
180     READ P%(I%,J%)
190     NEXT J%:NEXT I%
200 REM Input Viewpoint Data
```

```
210 INPUT TAB(1,1)"DISTANCE FROM
    VIEW",RHO
220 INPUT TAB(1,2)"DISTANCE FROM
    SCREEN",DIS
230 INPUT TAB(1,3)"HORIZONTAL
    ANGLE",TH
240 INPUT TAB(1,4)"VERTICAL
    ANGLE",PH
250 TH=RAD(TH):PH=RAD(PH):PROCSETUP
260 REM Transform and Plot Object
270 FOR I%=1 TO N%
280   PROCTRANS(I%)
290   NEXT I%
300 PROCFRAME
310 AA=GET:CLS:CLG:GOTO 210
320 END
330 DEFPROCSETUP
340 S1=SIN(TH):C1=COS(TH)
350 S2=SIN(PH):C2=COS(PH)
360 ENDPROC
370 REM Transform World to Screen
    Coordinates
380 DEFPROCTRANS(I%)
390 X=W(I%,1):Y=W(I%,2):Z=W(I%,3)
400 X1=-X*S1+Y*C1
410 Y1=-X*C1*C2-Y*S1*C2+Z*S2
420 Z1=-X*S2*C1-Y*S2*S1-Z*C2+RHO
430 D=DIS/Z1:S(I%,1)=D*X1:S(I%,2)
    =D*Y1
440 ENDPROC
450 REM Plot Object Planes as
    Wire Frame
460 DEFPROCFRAME
470 FOR I%=1 TO M%
480   K%=P%(I%,1):MOVE S(K%,1),
    S(K%,2)
490   FOR J%=2 TO NP%(I%)
500     L%=P%(I%,J%):DRAW S(L%,1),
    S(L%,2)
510     NEXT J%:DRAW S(K%,1),S(K%,2)
520   NEXT I%
530 ENDPROC
540 REM Coordinate,Point & Plane
    Data for House
550 DATA 200,-200,-200,200,-200,200
560 DATA 200,200,200,200,200,-200
570 DATA -200,200,-200,-200,200,200
580 DATA -200,-200,200,-200,-200,
    -200
590 DATA 0,200,300,0,-200,300
600 DATA 4,4,4,5,5,4,4
610 DATA 1,2,3,4,1,8,5,4,5,6,7,8
620 DATA 4,3,9,6,5,1,2,10,7,8
630 DATA 2,10,9,3,7,10,9,6
```



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Basically sound

***Deve Windie** explains how to generate different sound effects using Basic*

One of the few ways in which the Dragon 32 lags behind some of its competitors is in its sound handling capabilities. Having just one sound channel is somewhat limiting.

However, if you have heard the sounds on, for example, Microdeal's *King* or *Frogger* games, you will be aware that the Dragon is capable of quite sophisticated effects. The problem is, of course, that these commercial tapes use machine code to generate the sounds needed. Now, not everybody can (or indeed, wants to) cope with machine code. So, let us examine just what the Dragon can do in the sound effects department, using only Basic.

First, we will deal with the *Sound* command. On the face of it, this command allows us to use just one sound at a time; try *Sound 1, 10*. Not very spectacular, is it? However, it can be improved upon — try listing one.

Better, but still quite limited. Apart from lots of separate *Sound* command lines, this type of program is just about the only way to get anything like a reasonable effect using *Sound*.

Let us go straight on to the more useful *Play* command. This command can be used to produce both music and many varied noises for games. To use *Play* we have to construct a string of notes and instructions and then tell the computer to *Play* the string.

The two line program in listing 2 contains only the notes to be *Played*. The octave, length, tempo and volume have all been left to the default settings. The *Play* command offers more control over the notes in the string.

It is possible to *Play* notes either sharp or flat. We can also modify the four string elements mentioned earlier, using:

- \+ to add one to current value
- − to subtract one
- < to divide by two
- \> to multiply by two

These suffixes are useful when creating sound effects for games. For an example try listing three.

When using the *Play* command to produce tunes within your programs, the tempo parameter will usually be set at around *T2* or *T4*. For sounds representing laser zaps or warp drives etc, you will need to raise this setting to around the *T150* mark (see listing four).

If you do not read music, it can be difficult to work out the tune required. Listing five is a simple program to allow you to pick out tunes using the keyboard. No attempt has been made to set up the notes in any piano type key arrangement.

The notes are obtained by pressing the letter keys *A* to *G*. To cancel a note, just press the left arrow key and the note will then be erased from the screen. Once the tune sounds right, copy the notes from the screen for use in future programs.

The sound experiment program allows you to enter up to 10 strings of notes. You can then experiment with octaves and speeds, etc, to produce many different sounds from one set of strings.

Notes

Lines	
10 to 40	Instructions
50 to 80	String inputs
110 to 150	Set speed
160 to 210	Set volume
220 to 280	Set octave
290 to 310	PLAY string routine
320 to 370	Change or repeat option
380 to 470	Change string subroutine

```
"LISTING 1

10FOR A=200 TO 220
20SOUNDA,1:NEXT A
```

```
"LISTING 2

10 A$="FFFCODC"
20 PLAY A$
```

```
"LISTING 3

10 A$="O4;V-GD"
20 PLAY A$
30 GOTO20
```

```
"LISTING 4
10 A$="BAGFEDC"
20 B$="BAGCBAGCBAGC"
30 PLAY A$: GOSUB 100
40 PLAY B$: GOSUB 100
45 FOR L=1 TO 10
50 PLAY"T150"+A$:GOSUB100
55 NEXT L
57 FOR L=1 TO 10
60 PLAY B$
65 NEXT L
70 END
100 FOR K=1 TO 100:NEXT:RETURN
```

```
"LISTING 5
10 CLS:Y=0
20 A$=INKEY$
30 IF A$=CHR$(8) THEN PRINT@Y-1,
" "
40 IF A$=CHR$(8) THEN GOTO20
50 IF A$="" THEN 20
60 PLAY"O3;L4"+A$
70 PRINT@Y,A$
80 Y=Y+1
90 GOTO20
```

```
SOUND EXPERIMENT PROGRAM
10 CLS:'TRYSOUND**DAVE*WINDLE*83
20 PRINT@6,"EXPERIMENTAL SOUNDS"
:PRINT:PRINT" WITH THIS PROGRAM
YOU CAN ENTERUP TO 10 STRINGS OF
 NOTES        ( C TO B)"
30 PRINT:PRINT" YOU CAN THEN CHO
OSE 'SPEED',   'VOLUME' AND 'OCT
AVE'"
40 PRINT@450," PRESS 'SPACEBAR'
TO START"
50 S$=INKEY$:IF S$=" " THEN 60 E
LSE 50
60 CLS:X=1
70 PRINT"ENTER STRING NUMBER ";X
;:INPUTA$(X):X=X+1
80 IF X=10   THEN 90 ELSE 70
90 CLS
100 PRINT"NOW YOU CAN SET SPEED,
          VOLUME AND OCTAVE."
110 PRINT@162 ,"SPEED=FAST...MED
IUM...SLOW";:INPUT T$
120 B$=LEFT$(T$,1)
130 IF B$="F" THEN T$="T155"
140 IF B$="M" THEN T$="T50"
150 IF B$="S" THEN T$="T8"
160 PRINT@226,"VOLUME...LOUD..AV
ERAGE..SOFT "
170 INPUT V$
180 B$=LEFT$(V$,1)
190 IF B$="L" THEN V$="V30"
200 IF B$="S" THEN V$="V5"
210 IF B$="A" THEN V$="V15"
220 PRINT@290,"OCTAVE...1 TO 5"
230 INPUT O
240 IF O=1 THEN O$="O1"
250 IF O=2 THEN O$="O2"
260 IF O=3 THEN O$="O3"
270 IF O=4 THEN O$="O4"
280 IF O=5 THEN O$="O5"
290 FORX=1 TO 10
300 PLAY T$+V$+O$+A$(X)
310 NEXT X
320 CLS:PRINT" PRESS 'S' TO CHAN
GE STRING OR  'A' TO ALTER VOLUM
E ETC.","'P' TO REPEAT SOUND"
330 C$=INKEY$:IF C$=""THEN 330
340 IF C$="S" THEN GOSUB 380 ELS
E 360
350 GOTO290
360 IF C$="A" THEN GOTO  90
370 IF C$="P" THEN 290

380 CLS:FOR X=1 TO 10
390 PRINT"STRING ";X;"="A$(X):NE
XTX
400 PRINT:INPUT" WHICH DO YOU WA
NT TO CHANGE";N
410 CLS: PRINTA$(N)
420 INPUT"ENTER NEW STRING";N$
430 A$(N)=N$:CLS
440 FOR X=1 TO 10
450 PRINT"STRING ";X;"="A$(X):NE
XTX
460 INPUT" ENTER 'R' TO RETURN";
R$
470 IF R$="R" THEN RETURN ELSE 3
80
```

Out of character

***Pate Garrard** creates user defined graphics characters*

One of the least documented features of the 64 must be its ability to produce user-definable graphics characters

Normally the 64 gets its character information (ie the shape used to make up each character) from the character generator Rom, which starts at location 53248 and continues up to 57344 in eight blocks of 512 bytes each These are stored as shown in figure 1

To use this information we'll need to know how to turn character sets on and off, so let's see how that is done on the Commodore 64 The video interface chip (known as the Vic chip) which controls all of the graphics on the computer, like any other 8 bit chip can only 'see' 16K of memory at a time so it has to be told which block of 16K you want it to look at There are four of these 16K blocks of memory in the 64 and to swap from one to the other the following formulae are used

```
POKE 56578 PEEK (56578) OR 3 REM SETTING
  BITS 0 AND 1 OF PORT A OF 6526 CHIPS2 TO
  ZERO
POKE 56576 (PEEK (56576) AND 252) OR A REM
  SWOP FOM BLOCK TO BLOCK
```

If $A = 0$ we're looking at locations *$C000-$FFFF* (starting at 49152), if $A = 1$, we're looking at locations *$8000-$BFFF* (starting at 32768) If $A = 2$ we're looking at locations *$4000-$7FFF* (starting at 16384) and if $A = 3$ we're looking at locations *$0000-$3FFF* (starting at 0) On power up we're always looking at locations *$0000* to *$3FFF* or block 0

To swop character sets in and out a few more things have to be done One of the peculiarities of the 64 is that the locations occupied by the character Rom are the same as those occupied by the Vic chip control registers There's nothing to worry about however because of the block switching procedure they're never in the same place at the same time

To change the location of character memory, the following syntax is used

```
POKE 53272 (PEEK (53272) AND 240) OR A
```

where the value of *A* obviously determines where character memory will now sit A value of 0 starts it at zero 2 at 2048 and going up in blocks of 2048 bytes *A* successively takes the values 4, 6, 8, 10 12 and 14 whereupon character memory will start at *$3800*, or decimal 14336

When swopping character sets around, we need to block off all interrupts to the computer This is done by *Poke 56333, 127*

Since the character Rom is sandwiched between the Input/Output Rom on top of it and user Ram underneath it we must also switch out the I/O Rom This is done by *Poke 1, 51*

Now we can read our character information from Rom and store it in Ram The following line copies 128 characters from Rom (in fact the first 128 characters, from location 53248 upwards) and puts them into Ram

```
FOR X = 0 TO 1023 POKE 53248 + X PEEK (53248
  + X) NEXT
```

Now this means that the first 128 characters of character Rom are sitting in locations 53268 to 54271 (1024 bytes further on, as each character information occupies 8 bytes and we've just moved 128 of them) so locations 54272 and upwards are now available for our own use Thus we now need to know how to define our own characters So, let's see how a typical character is made up taking the letter *A* as an example

Every character on the 64 is designed as an 8 by 8 pixel grid like this

```
00011000
00111100
01100110
01111110
01100110
01100110
01100110
00000000
```

where the zeros tell the computer which pixels are to be turned off, while the ones signify which pixels are to be turned on Thus, the letter *A* is built up

To define our own character, it too must be created on an 8 by 8 grid We'll define a little alien

```
00011000
00111100
01011010
11111111
01100110
01100110
11000011
11000011
```

We need to tell the computer which pixels to turn on and which to turn off This is achieved by assigning a number to each column of our grid like this

```
ABCDEFGH
00011000
00111100
01011010
11111111
01100110
01100110
11000011
11000011
```

where $A = 128$ $B = 64$ $C = 32$ $D = 16$, $E = 8$ $F = 4$ $G = 2$ and $H = 1$

Now, we look at each row of the grid and wherever we see a number 1 we add the appropriate value for that column Thus our little alien now becomes a series of numbers for each row

```
24 60 90 255 102 102, 195 195
```

Row 1 for instance is made up of $0 + 0 + 0 = 16$ (*D* is turned on) + 8 (*E* is turned on) $+ 0 + 0 + 0$ equals 24, and so on

Going back to our earlier program we can now add the following lines to read the data for our new character and put it immediately after the first 128 characters read from Rom

```
FOR X = 0 TO 7
READ A POKE 54272 + X A
NEXT X
DATA 24 60 90 255 102 102 195 195
```

Obviously, you'd be making up more than one new character and so the range of the *For ... Next* loop would be increased, and the data statements would be extended All we have to do now is turn I/O back on again, switch interrupts back on again and tell the Vic chip where its video memory has gone This is done with

```
POKE 1 55 POKE 56333 129
POKE 648 196 POKE 56576 4 POKE 53272 21
```

So video Ram now starts at 50176 character Rom (or more accurately Ram) now starts at 53248, but colour memory stays where it is

There are a couple of side effects to doing all of this sprites now become 24 × 24 pixel characters, their data pointers now go from locations 51192 to 51199 and to find where you must now store your sprite data use the formula $(49012 + (74 * A))$ where *A* is the data block you want to point the sprite at Remember also that sprites are now 72 bytes, not the usual 63

By using this formulae you'll be able to build up a whole series of character fonts perhaps stored as a file on disc and called in when needed ■

Block	Address Decimal	Hex	Contents
0	53248	D000-D1FF	Upper Case Characters
0	53760	D200-D3FF	Graphics Characters
0	54272	D400-D5FF	Reverse Case Upper Case Characters
0	54784	D600-D7FF	Reversed Graphics Characters
1	55296	D800-D9FF	Lower Case Characters
1	55808	DA00-DBFF	Upper Case & Graphics
1	56320	DC00-DDFF	Reverse Case Lower Case Characters
1	56832	DE00-DFFF	Reversed Upper Case & Graphics Characters

CHOOSING A HOME MICRO

WARNING

Choosing a home micro can be a daunting task to the newcomer, and with an ever increasing number of micros emerging on the market, even up-grading, say, from a ZX81 can be a risky and expensive exercise if the wrong decision is made. It is important to look at the real facts and specifications, and check exactly what you get for your money before choosing your micro-computer system.

THE PITFALLS

"DON'T LET THE ADD ONS ADD UP"

A number of large companies are offering packages that seem to be good value and low cost
These offers usually have a hidden sting inasmuch as the essential accessories such as connection leads peripherals and software often carry very high cost premiums e.g. software for low cost hardware usually costs between £29 and £49 for a ROM cartridge!!

CHECK THE QUALITY OF THE PRODUCT.

Raw materials are now an area where corners can be cut and shoddy workmanship during building can effect the up time of your unit. Areas to watch out for are unreliable edge connectors corrosion and poor quality P.C.B.s. Low quality components and bad design will seriously effect the reliability of the end product, and can lead to false economy

DON'T BUY A GAMES MACHINE

Unless you want just games and nothing else! With a games computer you are limited
Some computers however have the advantage of both games facility plus the whole world of computing to explore as your interest and skills develop. A real computer system will allow you to expand your knowledge of the Hi Technology world and help earn its keep with its added uses in the field of education communication and home business use

SOFTWARE

Make sure the system you choose has a growing library of support software to enable you to realize the full potential of your machine

KEY POINTS TO LOOK FOR

● High Resolution Colour

In general most home computers have a poor graphics resolution (or detail). Check on the vertical and horizontal resolution in graphic mode and multiply the two numbers together. If the result is less than 35 000 then the graphics can hardly be considered high resolution. Without high resolution graphics displays such as those used in games tend to be "Chunky" in appearance

● High Quality Sound

Some computers claim to provide a sound channel when in reality all that can be found inside the computer is a small buzzer controlled by electronic pulses. At the very least a sound facility should provide more than one channel and a noise channel as well (for gun shot effects in games for example). The best systems also provide envelope control of the sound channels to produce very sophisticated effects, very important for generating music. Also look for the ability to connect to external amplifiers

● Keyboard

For accurate entry of programs and data into a computer it is important that the keyboard has a good tactile feel in operation. Coupled with acoustic feedback the user is fully aware when the computer has accepted his/her actions. Also of importance in a keyboard is layout. A standard computer keyboard layout will familiarise the user with the vast majority of computers used in the world of business and professional applications, very important if the purpose of purchasing a computer is educational

● RAM

One of the most important features of a computer is the amount of RAM, or memory included. In general the more powerful and exciting a computer program is the more RAM it requires. But take care all computers are advertised quoting the total RAM used in the system. Computers use up a great deal of their own RAM for storing essential data and particularly in supporting the graphics display and the CPU. If it is less than 32K think again is it enough?

● Computer Language

It is too difficult to program a computer in its own binary language so high level languages are used the most popular being BASIC. However there are a number of BASICs some being very different from the rest. A de facto standard in the computer industry is Microsoft BASIC. Learn this one and you will be able to program in the majority of computer BASICs such an important point if a home computer is to be used to educate your children to face the technology of the future

● Expansion

As your interest and knowledge of computing grows you will need a computer system that will grow with you able to accommodate Printers Disk drives Joysticks Communications Modem and Colour Monitor as well as produce Hi Fi sound effects

● Software

The computer you choose should have a growing selection of utility software to make the most of its capability
Remember computing is here to stay. You can't learn to compute on a toy or a device which does not behave like a real computer
In short look out for a computer which offers all the points above and you will be sure of getting the best value for money

Che[illegible] money. Check full specification plus peripherals and software prices before you buy. Preferably choose a Real computer system that can expand to meet your needs

To find out which company offers you the right choice, with:-

- Good value, high specification, quality micros.
- A quality, 4 colour, plain paper printer/plotter.
- Communications Modem.
- Micro Disk Drives.
- Comprehensive and growing range of software

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Copyline

on ZX81

One of the biggest problems with the ZX81 and printer is the lack of a command to print selected lines from the screen: *Copy* prints out the whole screen — this 39 byte machine code routine solves this problem by letting you print any number of screen lines you wish.

First type in the Hex loader making sure that the *Rem* statement has at least 39 full stops. Then run this program entering the Hex numbers on the left hand side of the other printout when prompted. To make it clear it should start ED4B 7B40 7980.

When the numbers have been entered all the lines except 1 should appear deleted.

Using the routine

1. *Poke* 16507 with the number of the first line to be printed (remember the first screen line is 0)
2. *Poke* 16508 with the number of lines to be printed
3. *Let* ZZZ = *Usr* 16514

The program changes the D register which usually holds 22 for the *Copy* command to (Peek 16508) and HL to (Peek 16396 + 256*Peek16397 + 1 + (33*Peek 16507)). It then jumps into the Rom at the next address of the *Copy* routine.

```
ED4B7B40   LD BC,(407B)
79         LD A,C
80         ADD A,B
FE17       CP 17
D0         RET NC
3A7B40     LD A,(407B)
CD1D15     CALL 151D
3E21       LD A,21
CD1D15     CALL 151D
EF         RST 28
04         DEFB 04
34         DEFB 34
CDA70E     CALL 0EA7
03         INC BC
2A0C40     LD HL,(400C)
ED4A       ADC HL,BC
3A7C40     LD A,(407C)
57         LD D,A
C36F08     JP 086F
```

```
   1 REM ..............................
.............
  10 LET X=16514
  20 LET A$=""
  30 IF A$="" THEN INPUT A$
  40 IF A$="S" THEN STOP
  50 POKE X,16*CODE A$+CODE A$(2
)-476
  60 SCROLL
  70 PRINT X,"   ",A$( TO 2),TAB 3
1
  80 LET X=X+1
  90 LET A$=A$(3 TO )
 100 GOTO 30
```

Copyline
by Clive Petry

Words

on Ace

This is a listing of *Forth* words. These words will fit on any Jupiter Ace regardless of memory and are intended to provide missing or helpful features for the competent programmer. Simply type them in as they are printed and they will be ready for use.

EXPECT

This requires two numbers on the stack: on top a delimiter and second from top an address. What it does is give the user a chance to type in a string and then it will put the first character to the specified address, the second to the address + 1 and so on. This is handy as it allows several messages to be typed in and stored in memory leaving the *Pad* free for more immediate things.

```
: EXPECT
QUERY WORD C@ 0
DO
9986 I+ C@ OVER
I+ C!
LOOP
DROP
```

MEM

This simply tells the user how many spare bytes are left for *Forth* programming.

```
: MEM
15386 @ HERE — CR
." Bytes left."
CR
```

SCREEN-

This needs two numbers on the stack: a line number second from top and on top a column number. It will leave on top of the stack the character code of the character at those screen coordinates and also set the print position to those coordinates as well.

```
: SCREEN$
AT 15388 @ C@
```

BASE

This will tell the user the present number base in decimal, eg if the computer is working in *Hex* ?base will display Base 16. It does not alter the number *Base*.

```
: ?BASE
BASE C@ DUP DECIMAL
CR ." Base " CR
BASE C!
```

NORMAL

This word will reset various system variables; they are:

Base set to 10 (ie decimal)
Visible mode restored
Slow mode restored
Both stacks are cleared
The screen is cleared

```
: NORMAL
CLS DECIMAL VIS
SLOW QUIT
```

Words
by A Cranston

Renumber

on Oric

This program should be useful to all Oric owners as there is no renumber facility within the Oric basic. The program has been written in basic and renumbers program lines (*Gosub's*, *Goto's* etc are not catered for in this version).

The program also helps to explain how the Oric stores basic programs in memory.

Variables

DEEK (#9A) = start of basic program
DEEK (#9C) = end of basic program = E
A = address of basic program line = DEEK (A)
N = line number
S (initially) = start line number from
I = increment.

To use the program simply enter *Goto* 63900. An increment range of 1 to 100 has been permitted but this is easily changed in line 63925.

```
63900  REM*RENUMBER by G M Jackson
       copyright 1983
63905  PRINT CHR$(12) SPC (10) "RENUM-
       BER" PRINT
63910  INPUT "Commence line numbers from" S
63915  IF S<1 OR S>63899 THEN GOTO 63910
63920  INPUT "Increment by" I
63925  IF I<1 OR I>100 THEN GOTO 63920
63930  A=DEEK (#9A) E=DEEK(#9C)
63935  N=DEEK(A+2)
63940  IF N>=63900 OR A>E THEN PRINT
        "RENUMBER COMPLETED" END
63945  DOKEA+2 S S=S+I A=DEEK(A)
63950  GOTO 63935
```

Renumber
by G Jackson

Speed Run

on Vic20

Drive your rally car across rocky desert terrain to the next checkpoint flag located somewhere along the top of the screen. Each flag reached gives a score and another 10 rocks to avoid. Remember that you only have 15 minutes of fuel so don't hesitate.

Program notes

1-40	Initialise variables and graphics
45-55	Set up screen
80-110	Test key pressed
200-400	Move car
2000 2100	Boom!
5000 5100	Flag reached in one piece
10000-end	Print time

PROGRAM OF THE WEEK

```
1 SC=0 NR=100
5 RESTORE X=8174 C=30720
10 REM*GRAPHICS*
15 FOR1=7160TO7215
20 READA POKE1,A NEXT1 POKE36869,255
25 DATA24,153,255,165,36,189,255,153
30 DATA0,0,24,60,124,126,255,255
35 DATA255,255,255,255,128,128,128,128
40 DATA230,60,124,231,231,124,60,230
42 DATA119,34,62,231,231,62,34,119
43 DATA0,140,140,149,244,149,140,0
45 GOSUB7000
50 GOSUB1000
55 GOSUB8000
60 TI$="000000"
65 GOSUB10000
70 POKEX,0 POKEX+C,6
75 REM*CAR DIRECTION*
80 POKE36878,5 GETT$
85 IFT$="U"THENPOKEX,160 X=X-22 GOTO200
90 IFT$="N"THENPOKEX,160 X=X+22 GOTO250
95 IFT$="N"THENPOKEX,160 X=X-1 GOTO300
100 IFT$="J"THENPOKEX,160 X=X+1 GOTO350
110 GOTO65
200 REM*MOVE UP*
205 POKE36874,170
210 IFPEEK(X)=1THENPOKEX+C,2 GOTO2000
215 IFPEEK(X)=2THENGOTO5000
220 GOSUB10000
225 POKEX,0 POKEX+C,6
230 FORR=1TO100 NEXT
235 GETT$ IFT$<>""THENPOKE36874,0 GOTO110
240 POKEX,160
245 X=X-22 GOTO200
250 REM*MOVE DOWN*
255 IFPEEK(X)=1THENPOKEX+C,2 GOTO2000
260 IFPEEK(X)=2THENGOTO5000
265 POKE36874,170 GOSUB10000
270 POKEX,0 POKEX+C,6
275 FORR=1TO100 NEXT
280 POKEX,160
285 GETT$ IFT$<>""THENPOKE36874,0 GOTO110
290 X=X+22 IFX>8185THENGOTO2000
295 GOTO250
300 REM*MOVE LEFT*
305 IFPEEK(X)=1THENPOKEX+C,2 GOTO2000
310 IFPEEK(X)=2THENGOTO5000
315 POKE36874,170 GOSUB10000
320 POKEX,4 POKEX+C,6
325 FORR=1TO100 NEXT
330 POKEX 160
335 GETT$ IFT$<>""THENPOKE36874,0 GOTO110
340 X=X-1
345 GOTO300
350 REM *MOVE RIGHT*
355 IFPEEK(X)=1THENPOKEX+C 2 GOTO2000
360 IFPEEK(X)=2THENGOTO5000
365 POKE36874,170 GOSUB10000
370 POKEX,3 POKEX+C,6
375 FORR=1TO100 NEXT
380 POKEX 160
385 GETT$ IFT$<>""THENPOKE36874,0 GOTO110
390 X=X+1 IFX>8185THENGOTO2000
395 GOTO350
1000 REM*POKE ROCKS*
1005 FORR=1TONR
1010 D=INT(RND(1)*506)+7680 IFD=8152THEN1010
1015 POKED,1 POKED+C,0
1020 NEXT
1025 Z=7680 FORT=1TO22 READW IFW=5THEN
     POKEZ+C,2
1030 POKEZ W POKEZ+C 0 Z=Z+1 NEXTT
1035 FORT=0TO22 POKEZ,1 POKEZ+C,0 Z=Z+1
1040 NEXTT
```

```
1045 PRINT"HS RETURN
1050 DATA1 1 1 1 1 160,160 160,160,160,1,1
     ,5,1 1 1 1 1 1,1
1060 DATA1,1
2000 REM*BOOM*
2005 POKE36874 0
2010 PRINT"
2020 PRINT"
2025 PRINT"
2030 PRINT"  **BOOM**
2035 PRINT"
2040 PRINT"
2045 FORV=15TO0STEP-2
2050 POKE36878 V
2055 POKE36877 120
2060 FORT=1TO300 NEXT
2065 NEXTV POKE36877,0
2070 PRINT"
2075 IFSC>HSTHENSC=HS
2080 PRINT"YOU SCORED SC
2085 PRINT"HIGH SCORE="HS
2090 PRINT"SPACE TO CONTINUE"
2095 GETA$ IFA$=""THEN3000
3000 FORR=1TO1000 NEXT PRINT"" GOTO1
3005 FORR=1TO1000 NEXT PRINT"" GOTO1
5000 REM*FLAG REACHED*
5005 POKE36874,0 FORS=220TO245
5010 POKE36878,15
5015 POKE36875 S
5020 FORR=1TO15 NEXT
5025 NEXTS
5030 POKE36875,0
5035 G%=1000-TI/2 SC=SC+G% IFSC>HSTHENHS=SC
5040 PRINT"
5045 PRINT"E"HS
5050 PRINT"YOU DID IT!!"
5060 PRINT"YOUR SCORE="SC
5070 FORR=1TO3000 NEXT PRINT"
5080 NR=NR+10 GOTO5
7000 REM*TITLE SCREEN*
7005 POKE36879 25 PRINT"E"HS
7010 PRINT"
7015 PRINT"SPEED RUN!
7020 PRINT"
7025 PRINT"BY MARK KEDGLEY.
7030 PRINT"DRIVE YOUR CAR-
7035 PRINT"AVOIDING THE ROCKS-
7040 PRINT"TO THE CHECKPOINT FLAG
7045 PRINT"- -
7050 PRINT"KEYS
7055 PRINT"
7060 PRINT"U - FORWARDS
7065 PRINT"H - LEFT
7070 PRINT"? - RIGHT
7075 PRINT"N - REVERSE
7080 GETA$ IFA$=""THEN7080
7085 PRINT"
7090 RETURN
8000 REM*POKE FLAG*
8005 U=INT(RND(1)*21)+7724
8010 U=INT(RND(1)*21)+7724
8015 POKEU,2 POKEU+C,12
8020 POKEU 2 POKEU+C,12
8025 RETURN
10000 PRINT"TI$
10010 IFTI$="000015"THENGOTO2000
10020 RETURN
```

Speed Run
by Mark Ledgley

Charecter Definer

on Dragon

In this program you are able to define an image within an 8*8 grid which is then stored in a *Get* array. When using the program you have to enter eight 0's or eight 1's eight times. If you enter a 0 then the pixel at that point on the 8*8 grid will not be *Preset*. However if you enter a 1 then it will be *Preset*. The grid can be altered to a larger one by changing the number 8's in lines 70 80 90 100 160 200 220.

This program is ideal as a header to graphics programs where the 0's and 1 can be stored in data statements.

```
10 REM ********************
20 REM * CHARACTER DEFINER *
30 REM ********************
40 CLS
50 PRINTTAB(4);"A CHARCTER
   CREATOR"
60 PRINT PRINT"ENTER EACH LINE OF
   THE CHR$"
70 PRINT"AS A SERIES OF 8 '0' OR
   '1'"
80 DIM A$(8)
90 PRINT"  12345678"
100 FOR N=1 TO 8
110 INPUT A$(N)
120 NEXT N
130 PMODE4,1
140 PCLS:SCREEN1,1
150 DIM C(9,9)
160 FOR X=1TO 8:FOR Y=1 TO 8
170 K=0:IF MID$(A$(X),Y,1)="1"
    THEN K=1
180 PSET(9+Y,9+X,K)
190 NEXT:NEXT
200 GET (10,10)-(18,18),C,G
210 PCLS
220 PUT (110,110)-(118,110),C,PSET
230 IF INKEY$="" THEN 230 ELSE RUN
```

Character Definer
by J Blatch

Mine Blaster

on Spectrum

The game involves the players ship blasting as many mines in the time limit without hitting one and losing a life.

The game uses two machine code routines data for which is held in 710 and 720. One routine reverses the screen (for explosions) and the other scrolls the top two-thirds of the screen from left to right. The Print *Usr* statements call the machine code routines (lines 90 340) instead of Randomise as this can make the *RND* function not very random.

Line 10 checks to see if machine code is poked in, if so it goes straight into the game.

Program notes

80 270	Main loop
430-470	Plot boxes
480-630	User defined graphics
640 720	Machine code
800-870	Instructions

```
1 REM MINE BLASTER by K.Clatworthy
10 IF PEEK 30101<>6 THEN CLEAR 30100: BORDER 5: PAPER 5: INK 0: CLS : RESTORE 520: GO SUB 480: GO SUB 800
20 INK 7: PAPER 0: BORDER 0: CLS
30 LET lives=5: LET w=0: LET aliens=15: LET speed=10: LET mines=0: LET time=1: LET a=10: LET b=0: LET c=2: LET d=b
40 FOR x=17 TO 21: PRINT AT x,0, PAPER 4,"                                ": NEXT x: GO SUB 430
50 PRINT 80, INK 0,"  MINE BLASTER" by K.Clatworthy"
60 PRINT AT 19,4, PAPER 5, INK 1,"LIVES=";lives;" MINES=";mines;" TIME=";time
70 PRINT AT (RND*11)+3,(RND*7)+24,"*"
80 PRINT AT 19,25, PAPER 5, INK 1,time
90 PRINT AT 21,0, INK 4, PAPER 4,USR 30101
100 IF time>800 THEN GO TO 730
110 IF INKEY$="6" THEN LET a=a+1: GO TO 160
120 IF INKEY$="7" THEN LET a=a-1: GO TO 160
130 IF INKEY$="" THEN GO TO 160
140 PRINT AT a,0, OVER 1,"*": LET h=(b*8+3): LET i=(a*8)-171: GO TO 150
150 FOR n=h TO 49 STEP 8: LET time=time+4: PRINT AT 19,25, PAPER 5, INK 1,time: BEEP .01,50: PLOT OVER 1,h+n,i: PLOT OVER 1,h+n-5,i: GO SUB 280: NEXT n
160 IF a>15 THEN LET a=a-1
170 IF a<1 THEN LET a=a+1
180 IF POINT ((b*8),((a*8)-172))=1 THEN GO SUB 310
190 IF a<>0 AND c<>a AND POINT ((b*8),((a*8)-180))=1 OR c<>a AND POINT ((b*8),((a*8)-164))=1 THEN GO SUB 310
200 IF c<>a THEN PRINT AT c,0," "
210 LET c=a
220 PRINT AT a,b, OVER 1, INK 0,">"
230 IF speed=1 THEN GO TO 250
240 IF time/aliens=INT (time/aliens) THEN LET speed=speed-1
250 IF time/speed=INT (time/speed) THEN PRINT AT (RND*13)+1,(RND*5)+28,"*"
260 LET time=time+1
270 GO TO 80
280 LET j=h+n+1: IF POINT (j,i)=1 THEN LET w=1
290 IF w=1 THEN GO SUB 310
300 RETURN
310 IF w=0 THEN LET lives=lives-1: PRINT AT a,0, INK 2, OVER 1,">": FOR g=0 TO 3: BEEP .05,-40: BEEP .05,-30: NEXT g: PRINT AT 19,10, PAPER 5, INK 1,lives: IF lives=0 THEN FOR g=0 TO -11 STEP -1: BEEP .2,g: BEEP .1,-g: NEXT g: BEEP .7,-30: GO TO 740
320 FOR y=0 TO 1
330 IF w=1 THEN BEEP .02,45
340 PRINT AT 21,0, INK 4, PAPER 4,USR 30300
350 IF w=0 THEN PRINT AT a,0, OVER 1, BRIGHT 1, INK 0,"*";AT a-1,0; BRIGHT 0, INK 7," ";AT a+1,0;" "
360 NEXT y
370 IF w=1 THEN LET mines=mines+1
380 LET time=time+1: PRINT AT 19,25, INK 1, PAPER 5,time
390 PRINT AT 19,18, PAPER 5, INK 1,mines
400 IF w=1 THEN LET n=54: PRINT AT a,INT (j/8), INK 7, PAPER 0;"  ": PRINT AT a,0,">": IF INT (j/8)<1 THEN LET lives=lives-1: PRINT AT 19,10, INK 1, PAPER 5,lives: BEEP .3,-35: IF lives=0 THEN LET w=0: LET lives=lives+1: GO TO 310
410 LET w=0
420 RETURN
430 LET p1=25: LET p2=20: LET p3=5
440 PLOT p1,p2: DRAW 210,0: DRAW 0,-13: DRAW -210,0: DRAW 0,13
450 PLOT p1-p3,p2+p3: DRAW 220,0: DRAW 0,-22: DRAW -220,0: DRAW 0,22
460 PLOT 0,40: DRAW 255,0
470 RETURN
480 FOR s=0 TO 7
490 READ a
500 POKE USR ">"+s,a
510 NEXT s
520 DATA 144,232,20,127,12,232,144,0,0,13,18,255,127,18,13,0,200,201,10,20,65,59,123,160
530 FOR r=0 TO 7
540 READ a
550 POKE USR "*"+r,a
560 NEXT r
570 FOR t=0 TO 7
580 READ a
590 POKE USR "*"+t,a
600 NEXT t
610 RESTORE 710
620 FOR f=0 TO 17
630 READ x
640 POKE 30300+f,x
650 NEXT f
660 FOR d=0 TO 24
670 READ x
680 POKE 30101+d,x
690 NEXT d
700 RETURN
710 DATA 33,0,64,1,0,24,22,255,122,150,119,35,11,120,177,32,247,201: REM SCREEN INVERT M/C
720 DATA 0,128,17,0,64,213,225,35,197,1,31,0,26,237,176,43,54,0,35,35,19,193,16,240,201: REM SCREEN SCROLL M/C
730 PRINT AT 10,9, BRIGHT 1, PAPER 4, INK 1, FLASH 1," TIME UP ": GO TO 750
740 PRINT AT 10,7, PAPER 3, INK 5, FLASH 1,"ALL LIVES USED"
750 PRINT AT 12,9, PAPER 4, INK 1," score = ",mines*(lives+1)*5
760 PRINT AT 2,5,"ANOTHER GAME? (y/n)"
770 IF INKEY$="n" THEN STOP
780 IF INKEY$="y" THEN RUN
790 IF INKEY$<>"y" OR INKEY$<>"n" THEN GO TO 770
800 LET a$="THE OBJECT OF THE GAME IS TO   DESTROY AS MANY SPACE MINES AS  POSSIBLE IN  THE TIME ALLOWED.  YOU MOVE USING KEYS 6 & 7"
810 LET b$="FIRE BY PRESSING ANY OTHER KEY."
820 LET c$="WARNING...USING THE BLASTER USESYOUR MISSION TIME ALLOCATION UP QUICKER."
830 LET g$="DON'T LET THE MINES HIT YOU!"
840 LET d$="TIME initially set to 800"
850 LET e$="to alter change variable ""time"" in line 100"
860 PRINT a$: PRINT : PRINT b$: PRINT : PRINT c$: PRINT g$: PRINT AT 17,0;"N.B.": PRINT d$: PRINT : PRINT e$: FOR h=0 TO 75: PAUSE 0
870 RETURN
910 STOP
9990 SAVE "BLASTER" LINE 10
```

Mine Blaster
by K Clatworthy

Error Message

on Dragon 32

This program is a modification of the error message program by Brian Cadge printed in *PCW* (18-24 August) — I have altered it to run with the Delta Disc System which does not allow for the use of high memory locations as are used in Brian's original.

```
1  MODIFICATION OF BRIAN CADGE S PROGRAM AS PUBLISHED IN P.C.W.
TO RUN ON delta disk system
2 '
3  G W.MOORE. 1/9/83
4
5 CLS PRINT@225,"FULL ERROR MESSAGES INSTALLING"
10 CLEAR200 26999
20 FORI=1TO62 READA$ V=VAL("&H"+A$  CS=CS+V POKE26999+I V:NEXT
30 DATA 32 62 BD ED,DC,BD 6A,C3,BD 84 34 7F 00,6F,BD,90 A5
40 DATA PE,63 DF,54 5D,27 A7 AF 60 26 F9 5A 20 F6,30 1F,BD,90 E5,9E,68,8C,FF,FF,
27 0D
50 DATA 1F 12 AE 69 D2,BD 90 E5 1F 20 BD 35,7A BD 90 A1 7E A3 71
60  IFCS  6124THENPRINT"DATA ERROR" SOUND 1 1 END
70 B=27100 FORI=0TO25
80 READA$
90 FORJ=1TOLEN(A$)
100 POKEB ASC(MID$(A$ J 1)) B=B+1
110 NEXTJ
120 POKEB 0:B=B+1
130 NEXTI
140 POKE27099,255
150 H$="$ IN " FORI=1TOLEN(A$) POKE27089+I,ASC(MID$(A$ I 1)) NEXT:POKE I+27089,0
160 POKE402 105 POKE403 130:POKE401 126
200 DATA NEXT W/O FOR 'CAN T YOU SPELL  STUPID!!!" RETURN W/O GOSUB,OUT OF DATA,
ILLEGAL FUNCTION
210 DATA ARITHMETIC OVERFLOW NO MORE MEMORY UNDEFINED LINE REF.,BAD SUBSCRIPT,RE
DIMENSIONED ARRAY
220 DATA "CAN T DIVIDE BY ZERO SILLY!" ILLEGAL DIRECT,TYPE MISMATCH NOT ENOUGH S
TRING SPACE RESERVED STRING TOO LONG   >255
230 DATA STRING TOO COMPLEX 'CANT CONTINUE" UNDEFINED FUNCTION,FAULTY DATA TYPE,
ALREADY OPEN ILLEGAL DEVICE#,I/O ERROR WRONG FILE TYPE,FILE NOT OPEN
240 DATA INPUT PAST EOF DIRECT STATEMENT
250 NEW
```

Error Message
by Geoffrey Moore

Microradio

GW6JJN

The naked ear

While tuning the radio receiver I mentioned last week you will come across RTTY This means Radio Teletype and most modern communication systems use it To most ears it sounds rather like the sound your cassette software tapes make if you care to listen to them.

Unlike morse, this code can not be understood by the naked ear, so to speak Before the advent of the home computer you would have had to spend a great deal of money on big teletype machines with a paper printout Now, with the micro, even a ZX81 you can receive and transmit RTTY

The major world news services use RTTY and even Tass the Russian news service can be decoded — of course, it helps if you speak Russian Still, most of the others are in English Again weather stations, radio amateurs, satellites and a host of other organisations use RTTY so the magic is all worth the effort

RTTY is in a code called the 'Baudot' code and is transmitted using frequency shift keying (FSK) This consists of sending a signal, which changes between two frequencies known as the mark and space frequencies These marks and spaces indicate the start of each character, the end and the various bits in the middle which comprise the message

As RTTY is a code, a short program is required to decode it Then an interface is necessary to change, with great accuracy, the micro's parallel information to serial information This interface will set the baud rate, or the number of characters per second, and consists of a clever chip called a UART (Universal Asynchronous Receive Transmitter) Also required is a tone unit which converts the micro's voltages to the correct tones, rather like a modem

Unless you are extremely well versed in electronics, then it is probably preferable to buy the complete package for your micro especially since prices for the complete unit for the ZX81 and Spectrum start at around £35 I hope to be reviewing a unit in this column soon

To be equipped to send, or even just receive, RTTY will open up a new world There is a great deal of RTTY on the short wave as well as higher frequencies, everything from snowstorms on the icepack to the price of fish in Hong Kong

Next week, up into space to talk about satellites Keep the input coming All these subjects will be dealt with in this column ■

Ray Berry GW6JJN

● Dr Owen Garriott, one of the crew of the latest US space shuttle Columbia is an amateur radio enthusiast

He has been given permission to take his equipment with him on the mission and broadcast for an hour a day

The Columbia will be launched on October 28 and during each hour s transmission, his broadcasts will be in range of British radio amateur radio enthusiasts for eight minutes

More information from John Nelson at the Radio Society of Great Britain


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Cave Crawler

Back to the mainstream for the Adventure review for this week which is *Quest* the new tape from Hewson Consultants who have been rather busy releasing new stuff

Before anything starts the program asks what character you would like to play What an agonising choice! You'll find all the old favourites on the menu — Wizard Cleric Rogue Fighter or Simpleton

To pick the last one is not as daft as it might appear — each character has its own blend of the usual D & D-type attributes (Strength Dexterity Wisdom and so on) and the Simpleton has a large helping of Charisma as well as being quite strong Of course it's not bad to be a Fighter either with his 50 points of Strength although he is not very charming (only 10 points of Charisma)

My personal favourite however is the Wizard who has a roughly average point score in each attribute but can of course use all the spells available These number 12 in all and range from Magicglow which acts a lamp for the blink of an eye through Longlight and Firebolt to Superstrength and Zaphim

All these must be bought and each character may only use a certain number, except the wizard who as I said may use any spell

Characters chosen the Quest begins This is another split-screen program (they're really popular nowadays aren't they?) with an unusual text input This is confusingly at the top of the screen and is limited to a 32-character line

The Adventure follows the usual format — I've lost count of the number of times I got lost in the blasted wood — and the program recognises all the usual words along with a few peculiar to this Adventure like *Buy* and *Cast*

Help elicits not the usual cryptic clue, but information about the monster or weapon specified To get a clue the player has to type *Hint*

Some 30 commands are given in the documentation (the cassette inlay that is!) but you will have to find others out for yourself

Not only do the Spells follow D & D practice but the combat procedure is also Fantasy Role-Playing in basis The computer calculates and compares "hits" for each side with dice throws for each opponent

Thus the result of, say three dice throws (this depends on the monster) is added to the Hit Points of the Monster and this figure compared with the result of a similar computation for the Player The winner is the one with the higher result Before fighting the player can find out the opponent's Hit Points and dice throws by typing *Help*

Should the player lose this confrontation there is a resurrection procedure but this doesn't always work, and if it does, the player may well find things have changed somewhat!

There is a maximum of 600 points to be scored — in the few days I've had the tape I've managed to achieve a rating of *Cave Crawler* At least the program doesn't gloat when assessing your performance But I don't know what other ratings there are yet!

This is of course one of the time-honoured ways to ensure that the player returns again and again to the game but unfortunately there is a major hurdle in the way of doing so — once the present game is finished, the program just hangs up! No warning, no explanation just a screen that sits there looking at the player defying all attempts at restarting! So it's back to *Loading* the thing again and that seems to take forever!

Surely Hewson could have arranged a Y/N routine to enable the player to try again?

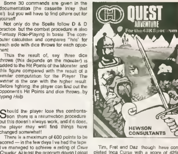
Apart from this flaw and the weird text input, I liked the program and I'm looking forward to getting off the Cave floor!

Quest, which just about fills the 48K of the Spectrum comes closer to combining the thrills of D & D with the intellectual problems of Adventure than any other Adventure I can think of and I can recommend it without hesitation

Back to the Spectrum to finish Tim Fretz and Daz (are you sure?) are stuck at the door to the computer room — I would think that you should do something nasty to the door haven't you gota gun yet?

Artic themselves have Help Sheets for their Adventures and it may be worth writing to them On this subject however several people have returned tapes that they believe to be faulty to Artic who have advised them to contact Sinclair

Now that Sinclair have signed an exclusive deal with Artic, all correspondence about faulty tapes should be addressed to them



Tim, Fret and Daz though have completed Inca Curse with a score of 4250 and they would like to know if this is a record?

Sorry chaps but the same day brought a letter from Andrew Sweetley and his friend who let me know that they had completed Inca Curse with — you guessed it! — 4250 points!

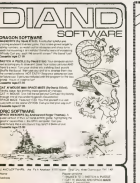
Finally another update to the Hobbit Hall Of Fame

1 Edgar Whitley who completed the Adventure in 9½ minutes — is this a record, he would like to know?
2 Kevin Cowley whose brother bet him a Spectrum game that Kevin's name wouldn't be mentioned! Sorry Kevin's brother, but you owe your brother *Manic Miner* at the very least!
3 Paul Millar
4 Bilbo (Chris) and Elric (Neil), who are now off to beans and Hula Hoops!
5 Alistair King (who is 10 and did it in *two* games)
6 Gary Collier who completed the game in five days
7 Miss Nicky Evers

Next week I will be having a look at the Scott Adams empire ■

This series of articles is designed for novice and experienced Adventurers alike Each week Tony Bridge will be looking at different Adventures and advising you on some of the problems and pitfalls you can expect to encounter So if you have an Adventure you want reviewed or if you are stuck in an Adventure and cannot progress any further write to Tony Bridge Adventure Corner, *Popular Computing Weekly* 12-13 Little Newport Street, London WC2H 3LD


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INTERRUPT SCAN

Mr T Thomas of Newstead Road, Weymouth Dorset writes

Q **Could you please tell me what an Interrupt does?**

A An interrupt does exactly what its name suggests it interrupts the operation of the processor regularly throughout the time that a computer is powered up This is usually to scan the keyboard to see if a key has been pressed, or to refresh the Ram so that its contents do not decay For example the Spectrum's Z80a interrupts every fiftieth of a second to refresh the Ram In the more sophisticated games programs interrupts are often used to provide a quick keyboard response

MICRONET 800

Mr T Hennessy of Sidcup Road Mottingham London SE9 writes

Q **I have been abroad for almost all the last nine months, and my Issue 1 48K Spectrum is almost unused. I came back a week or so before the last Microfair, which I went to, to try and catch up on what I had missed. Among a large number of things that caught my eye (and in some cases my wallet) was a mention of Micronet 800. Unfortunately I was not able to follow it up I have seen it mentioned in a couple of computer magazines, once in connection with the Spectrum Can you tell me what it is.**

A Micronet 800 is a home computer network system that has about 30 000 pages of Prestel allocated to it Now all the main home computers are on line including the Spectrum When you join you get a Modem and full operating software that allows you to download the many programs that it carries From the users point of view the system is protected by a double set of identification numbers It is menu driven, with different sections for the various computers There are also advertisements, news, clubs and an electronic mailbox

The system is steadily expanding but I fear the biggest problem is something they can do nothing about, ie. the poor state of British Telecom s phone lines There are various mainframes running the system throughout the country with a main one in London which organises the mailbox an excellent facility but one that only works well if you live fairly near to the capital

Nevertheless it is a system that can only grow with time and is certainly a good way of keeping in touch with other computer friends Contact Micronet for further details Micronet 800 Bushfield House, Orton Centre Peterborough PE2 0UW

VOLUME OFF

David L Ward of Hibernia Point, Wolvercroft Road London SE2 writes

Q **If you use a ZX Spectrum with a video recorder you can send the sound output to the television, by plugging a lead from the Spectrum *Ear* socket, to the Video Microphone socket, at least you can on my Sony C5.**

But can you tell me if it is possible to turn off the internal speaker in the Spectrum, Not only do I always use the Spectrum through the video recorder, but sometimes the excessive sound in games becomes an annoyance, and I would rather play them in silence

A The simple answer is no, at least not from software unless you wanted to re-write part of the operating system in machine code and then hope that this would not be lost when another program is *Loaded* in with it

There is another alternative and that is to cut one of the two wires between the speaker and the Pcb (It goes without saying that this would invalidate your guarantee) Once done, you could wire a micro switch across the gap, it would then be possible to switch the speaker in and out as you wished

VIC NEWS

Mr A A Morris of Woodward Road, Prestwich, Bury, Lancs, writes

Q **I am a Vic owner and I want to join a club. But the classified ads in your magazine seem mainly for software I would like to meet other computerites, exchange ideas, have meetings and maybe paint same sort of monthly newsletter Can you put me in touch with anyone?**

A Yours is a common request and fortunately you live in a good position The nearest club to you (not, though tied to any specific computer), is in Bolton Contact David Atherton 16 Douglas Street, Manchester M29

Perhaps closer to your exact requirements is ICPUG (Independent Commodore Products User Group) The national contact secretary is at 30 Brancoates Road, Newbury Park Ilford, Essex Your nearest group is probably Clive Embrey 17 Santon Avenue, Fallowfield Manchester There is also an association of Vic20 owners For them you need to contact S Tomannek, 20 Milner Road, Sherwood Nottingham

BAUD RATE

Russell Lewings of Church Road Hatfield Peverel Chelmsford Essex, writes

Q **Is there any way of making the baud rate on a Spectrum quicker by using an add-on (not micro-drive)?**

A It is theoretically possible to alter the baud rate The tape routines in Rom would have to be copied into Ram Once there, the timing would have to be altered It is not as easy as it sounds I do not know of an add-on that does this, although it is possible they might become available in the future

Whilst there would be obvious advantages in speed and the amount of tape you need you may find that these advantages are out-weighed by the fact that with cassettes particularly the faster the baud rate, the more likely you are to get problems with the *Load/Save* operations

Mr B Tidd of 160 Howlands Welwyn Garden City, Herts has sent me a long letter about copiers after my reply in the August 18/24 issue of *PCW* He said that some copiers will copy any program and goes on to name Autocopy 2 I don't disagree What I actually said was, "I am surprised that so far no one has found a way of beating the copiers "

Mr Tidd goes on to explain that a copier can have a code key inserted so that it will crash if any attempt is made to copy it True but as a recent letters page has proved, it can be circumvented

But it was the third part of his letter that intrigued me most He asserted that a copier need never be overwritten even if all the 48K Ram is used I agree — if you can *Load* in blocks and move the position of the copier in memory But even so I cannot see how by doing this you can store a 48K program and however many bytes the copier takes up, in 48K

Finally Mr Tidd offers an interesting challenge that I hope some readers will take up — to write an auto-*Running* routine in Basic that does not involve moving *Ramtop*, and is not rendered useless when *Merge* is used (Several people have written to me with routines, which fail when *Merged*) I have printed this address in full, as he promises a copy of Autocopy 2 to the first person to send him a solution

Is there anything about your computer you don't understand, and which everyone else seems to take for granted? Whatever your problem *Peek* it to Ian Beardsmore and every week he will *Poke* back as many answers as he can. The address is *Peek & Poke, PCW*, 12-13 Little Newport Street, London WC2R 3LD.

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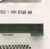



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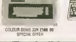

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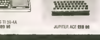

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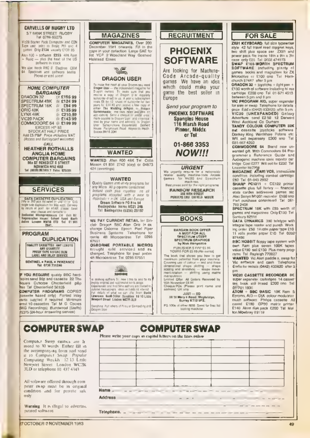
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ATARI VCS with five cartridges plus paddles and joysticks enclosed in a wooden storage box Hardly used Will sell for £90 ono Tel Scunthorpe (0724) 762749 after 5 pm

ATARI 400 Basic cassette recorder games and manual £120 Tel Bow Heath 57278

ATARI CONSUL AND PADDLES and joystick + 11 cartridges including Space Invaders and Asteroids £150 or exchange for Vic20 software Tel Southend (0702) 520460 after 5 pm

ATARI VCS joysticks paddles plus nine games £120 Sinclair Mini TV 2in screen battery operated £35 Boris Chess computer £95 or swap lot for computer Tel Accrington (0254) 38117 evenings

ATARI VCS + three tapes including Space Invaders Asteroids Championship Soccer £90 ono Tel 01 460 0252

ATARI 400 48K for 10 program recorder £120 worth of games including ???? 2049 Defender Back Up Quick Shot plus Atari joystick excellent condition still boxed £280 Tel 01 560 0606 after 6 pm

ATARI COMPUTER + joystick + paddles + lots of games software Tel Hemel Hampstead 57315

ARCADE MACHINE DISC £30 Atari 400 32K including Basic £60 410 recorder £30 Defender 2040 £15 each Tel Paddock Wood 4240

SPECTRUM 48K, printer Kempston joystick, £150 of software in case blank tapes £150 Tel Worthing 690135 (6 pm)

ATARI 400 with manuals Basic language cassette unit + 2 joysticks want £160 Tel Birmingham 581553 any time

Tandys for sale

EG 2000 Colour Genie 6 months old hardly used quality software value £275 Will sell for £175 Tel Tunbridge Wells 20781

TANDY BOOKS Going ahead with extended Colour Basic £3 Computer in Basic for Everyone £2 TRS Program Graphic £2 TRS 80 Program in Style £2 Tel Rustington (09062) 72845

TANDY TRS 80 colour computer 16K EXT Basic + Cassette Recorder + joystick + £100 Software Rainbow mags and manuals for a BBC B In good condition Tel Bittery Nr Bristol Tel 880 5478 (after 6 pm)

GENIE 1, 16K + b/w television + printer interface + software + books, £120 ono Tel 0272 842836

APPLE 2, 2 disk drive silent type printer colour monitor + software excellent condition £1 200 Tel Chelmsford (0245) 263655

APPLE 2 Euro plus perfect condition 4 months old £295 for a quick sale Tel 01 207 2815 (home) or 207 5860

INTRODUCTION TO BASIC (Vic20) parts 1 and 2 for sale Boxed tapes, stencil Immaculate condition £20 Also issues 1 30 Personal Computer News perfect condition only £7 50 ono Tel Stanford (0375) 676916

TRS 80 MODEL 1 level 2 16K good condition all leads manuals, plus over £80 of software £150 ono Tel 01-643 2647 (after 5 pm)

ORIC MICOMPUTER with software £29 Please phone Hornchurch 57485 (after 6 pm)

Wanted

WANTED Spectrum 16K new em sen Phone 8403n10 after 5 pm

PHILIPS video pack Seven cartridges — Freedom Fighter Pinball Cosmic Conflict £75 ono Phone 01 223 3638

WANTED Tandy SGP or Seikosha or similar printer for Dragon 32 Phone 021 3288501

WANTED Spectrum for a brand new Oric I with tapes Tel 237 7875 Call in afternoons

WANTED 48K Spectrum II in good condition with out S W for under £85 Tel 0902 343819 (evenings only)

WANTED Spectrum 48K willing to pay around £80 must be under guarantee without extras Tel 01 574 4122 between 6 pm and 9 pm

WANTED Science of Cambridge Mk 14 micro working or not Details to Mike Mercieca 42 Barons Court Road Penylan Cardiff CF3 7DG

WANTED ZX80 (eighty) working £12 or not working £6 plus your postage paid Tel Ringwood (Hants) 77738 after 6 pm

WANTED Colour portable in exchange for a black and white portable and multi-colour sports TV game Tel Billingham 551049 after 4 pm ask for Peter

WANTED BBC B with disc drive plus £230 will exchange my R registration Ford Escort for more information on car Tel Seaton 313 (Northumberland) Nr Newcastle call any time

WANTED 32K upgrade or Kempston joystick interface for Spectrum Swap either for Armageddon Ostron and Arcadia or will buy Angus Appleby 74 Charles Avenue Arbroath Scotland

SWAP VIC SUPER EXPANDER for 16K Ram Vic20 Tel 0532 823287 after 1 30 pm

SWAP TIMEGATE Scizolds Meteor Storm Space Intruders for very good condition Hobbit 44 Woodland View Station Strawless Norwich Write first Aberdeen or Pelanfenh Cash or swap

CALLING ALL IDIOTS, swap £1 £5 £10 £20 notes for a piece of paper with computer written on SAE plus money to W Mitchell Highmoor House Green Lane Melton Lincoln (Spectrum version available)

SPECTRUM OWNER to swap cassettes especially wants education or utilities but does want games Tel 0342 28569 after 4 pm

SWAP SPECTRUM SOFTWARE over 40 originals including Hobbit Scrabble Zues Assembler Forth hisoft Pascal or 75% cost for lists Write or call after 4 30 pm Flat 24 Kettering Court Thornton Heath Surrey

WANTED 48K Spectrum not more than £100 Tel Isle of Man 0624 26755

WANTED MURCHET 800 ADAPTOR suitable for Spectrum Any condition Tel 021 329 4474

For sale

FULLER SOUNDBOX FOR SPECTRUM as new also including joystick port and demo tape Full instructions £20 Tel 0268 27054 (anytime)

SWAP VIC20 Adventure cartridge Pirate Cove for Vudu Castle Tel J Gillespie on 01 653 7026

VIC20 SOFTWARE TO SELL, Crazy Kong Telly monsters O level cassettes maths 1 maths 2 English language and mistry books Zap Pow Boom Vic Revealed CBM 64 software to sell or swap Monopoly etc offers Tel 021-440 5260

LYNX 48K, new for Oric 48K Pyatt, 22 Arundel Drive Orpington Kent tel 20281 after 8 pm

ORIGINAL TAPES for sale including Zzoom Tranz Am Psst, Cookie A + F painter trader Reaton Jumping Jack Cater Piller Timegate Espionage Island Tel Iain after 5 pm Sunderland 493377

INGERSOLL multi-colour sport colour TV game Sell for £15-20 (private sale) or swap for Crazy Kong 16K plus any other Vic game Tel Billingham 551049 (after 4 pm)

DRAGON software 20 different tapes most popular titles £5 each or £75 the lot Tel 0582 807060 (after 6 pm private sale)

ORIC 48K brand new immaculate condition £30 software includes only £130 Tel 0255 429814 (Clacton)

SWAP PRINZ TRONIC micro 5500 colour TV game and metal detector for any Spectrum Tel Ipswich 41241 (Paul) between 6 and 7 pm

SPECTRUM owner would like to exchange tapes 16K or 48K Tel weekend Alan 01 570 1946

SHARP POCKET COMPUTER PC 1500 and four-colour printer cassette interface complete with instruction manuals and carrying case £170 ono Tel 01-802 1290

LOTS OF VIC20 SOFTWARE to swap Ring 0743 60890 after 6 pm and ask for Michael

SPECTRUM SOFTWARE to swap or sell also wanted TI 99 4A joystick will pay £10 ono Tel Hornchurch 57467

SALAMANDER Dragon Trek for Dragon 32 retail price £9 95 for quick sale £6 50 excellent condition still in original packing Tel 0636 814743 and ask for Richard

BLACK CRYSTAL, Monopoly game High Noon Spectrum software pack Cambridge colour collection collectors pack, club controller will swap for other Spectrum software Keith 6 Westbourne Terrace Dodworth Road Barnsley Yorks.

ADVENTURE HELPLINE

Micro *ZX Spectrum 16K*
Adventure *Haunted Death*
Problem *I cannot get out of the maze or press any buttons in the lift space ship or control room*
Name *Howard Freeman*
Address *Fordyke House Little Hale Sleaford Lincolnshire NG34 9BA*

Micro *Spectrum 48K*
Adventure *Velnor's Lair*
Problem *How do I get past the crevasse also where is the plank of wood hidden?*
Name *Rodney Karsopp*
Address *51 St Clement's Drive Leigh-on-Sea Essex*

Micro *BBC A 32K*
Adventure *Adventure 200 (Folklore Ltd)*
Problem *(1) How do you get past fierce snake? (2) How do you get into the tower with the huge evil guard? (3) How do you get into the room with ledges?*
Name *John Price*
Address *85 Rawlinson Lane Heath Charnock Chorley Lancs PR7 4DE*

Micro *Spectrum 48K*
Adventure *Knight's Quest*
Problem *How do you climb the glass mountain?*
Name *Paul Graham*
Address *2 Ash Grove Rode Heath Stoke-on-Trent Staffs*



PROGRAMMED

The Commodore 64 is an excellent machine with poor documentation and poor Basic. Books teaching the rudiments of the machine have become an almost mandatory supplement to the manual.

Computer programming with the Commodore 64 seems to cover almost everything you could wish to know about Basic programming of the Commodore and is well illustrated with charts and diagrams.

Perhaps the most suprising thing about this book is the price £2.75 — haven't Hodder and Stoughton been told that computer books have to cost £5.95 at least?

Book *Computer Programming with the Commodore 64*
Price *£2.75*
Micro *Commodore 64*
Supplier *Hodder and Stoughton, PO Box 702, Dunton Green, Sevenoaks, Kent TN13 2YD*

TRIP FOR TWO

My name is *Uncle Groucho* — you win a fat cigar. Well, no my name isn't *Uncle Groucho* but Automata's program's name is (if you see what I mean).

Understanding the above paragraph may be a good guide to your potential success at the program of the same name (as the Marx brother and as above).

Groucho the Marx brother is also Groucho the animated comedian in Automata's game. You follow him from town to town as you try to guess the identity of various hidden personalities. For each personality you guess correctly (all film stars) you get a clue to the real Hollywood personality who forms the basis of the prize that's on offer — a trip for two to Hollywood.

A quick play suggests that *Groucho* is well up to *Pimania* standard and is full of the dubious programming, great jokes and ideas that made *Pimania* such a winner. Oh yes, the hit single on the reverse side is wonderful!

Program *My name is Uncle Groucho – you win a fat cigar*
Price *£10*
Micro *Spectrum 48K*
Supplier *Automata, 65 Osborne Road, Portsmouth, Hants PO5 3LR*

REDEFINED

Picture Writer is an extension of the standard Dragon Basic which is supposed to improve the graphics capabilities of the machine.

Text is displayed directly so that it can be mixed with graphics. Other facilities allow text to be scrolled over graphics or text and graphics to be individually cleared.

In addition, the whole keyboard can be redefined and the new characters saved for future use.

Program *Picture Writer*
Price *£10*
Micro *Dragon 32*
Supplier *Rampage Software, 32 Birchwood Drive, Wilmington, Dartford, Kent DA2 7NE*

DAN DIAMOND

It had to happen. There I was knocking out new releases on my typewriter, the kind of machine an elephant would find easy to use, and in comes this guy with a sack.

"Wanna parcel mac?" Who does this guy think I am — Santa Claus? I could tell he wasn't one of the Popular staff — he had shoes on his feet.

"OK," I say, "it wouldn't be the first time curiosity got the better of this cat."

The parcel was a blast without a bomb. Diamond is back. That's Dan Diamond to you. Seems like the dude returned he got out of *Franklin's Tomb* but now he's *Lost in Space*. What's that they say about frying pans and fires?

Diamond's still working for Salamander Software and his adventures in space are, as with *Franklin's Tomb*, graphically illustrated in a manual that comes with the cassette.

Program *Lost in Space*
Price *£9.95*
Micro *Dragon 32*
Supplier *Salamander Software, 17 Norfolk Road, Brighton, East Sussex BN1 3AA*

RACE TRACK

J Morrison Micros has a reputation for providing good quality machine code games for the Dragon.

Its latest release for the Dragon are *Maurice Minor* and *Crusader* — the latter is a seven stage arcade game involving scaling walls and swinging across pits avoiding deadly scorpions and devilish dwarfs.

Maurice Minor is a racing game with some unusual features. You accidently find yourself on a race track whilst out driving in your *Morris Minor*: your only chance for survival is to join all the other racing cars in their race and try to win. There is an added problem in that your car is gradually falling to pieces — can you cross the finishing line before the final bit drops off?

Program *Maurice Minor*
Price *£6.95*
Micro *Dragon 32*
Supplier *J Morrison Micros, 2 Glensdale Street, Leeds LS9 9JJ*

MACHINE CODE

Taking the view that the subject of machine code on the Spectrum is too great a subject for one book, Interface has tackled the subject in two — volumes one and two of *Spectrum Machine Code made Easy*.

The first book covers roughly the same area as the other machine code books on the market, ie basic information on counting in hex, registers and simple programs.

Its complementary volume looks more closely at the Z80 and deals with jumping relatively, *Anding*, *Oring*, looping with double byte registers, Rom interrupts, etc.

An appendix includes Z80 instructions and mnemonics, system variables and a list of flags.

Book *Spectrum Machine Code made Easy Vol 1 and 2*
Micro *Spectrum 16/48K*
Price *£5.95 (per volume)*
Supplier *Interface Publications, 44-46 Earls Court Road, London W8 6EJ*

FRENCH TEST

Salamander — best known for Dragon software — has, in its latest group of releases, continued a gradual move into BBC programs with a utilities package, a flight simulator and *French Tutor*.

French Tutor is intended to provide both reference and testing on various aspects of French. The program has a dictionary of around 1,000 words and can test vocabulary, idioms and up to 20 irregular verbs.

There is also an option to create your own files for tests and storing them on tape. All accents including circumflex, grave, acute and cedilla are included and the program is compatible with all BBC operating systems.

Program *French Tutor*
Price *£9.95*
Micro *BBC B*
Supplier *Salamander Software, 17 Norfolk Road, Brighton, East Sussex BN1 3AA*

SUBLIME



It was victorious on the Vic and daunting on the Dragon now it's likely to be sublime on the Spectrum What is it? Why *Gridrunner* of course

Gridrunner is vaguely like *Centipede* except that it is made more difficult by roving spaceships that patrol the fringes of the screen taking pot shots

Although it doesn't boast the kind of spectacular graphics Spectrum owners might expect from say Ultimate, it's not difficult to see why *Gridrunner* is so successful — it's very addictive

There is no time to relax — from one direction or another you are always within moments of attack Expect bruised fingers

Program *Gridrunner*
Price *£6 95*
Micro *Spectrum 16/48K*
Supplier *Quicksilva*
13 Palmerston Road
Southampton
Hampshire SO1 1LL

DOOMED

Just what it is possible to fit into 3K seemed to change radically when Imagine swept into the Vic market with *Wacky Waiters* and *Arcadia*

Imagine's latest release for the Vic is *Bewitched* and again it will work on the unexpanded machine

The screen displays a maze — haunted labyrinths you have been doomed to roam by the evil magician Mordread Escape is nearly impossible but there is a way out The screen shows the maze split into three layers by doors The doors are coloured as are four keys located at the top of the screen Matching the colours you must open the doors and escape

As using the keys you find your way through the maze the minions of Mordread are unleashed increasing their numbers as you progress In order to try the next key you will have to run up the maze avoiding ever more baddies as you get further down the maze so the run for the next key gets longer

Program *Bewitched*
Price *£5 50*
Micro *Vic20*
Supplier *Imagine Software*
Imagine House
5 Sir Thomas Street
Liverpool
Merseyside L1 6BW



LINKED

Death Mines of Sirus is the first in a projected range of programs from Phoenix Software

The programs are based on a novel idea — each package contains two cassettes, the first being an arcade-style game, the second being a graphics adventure

The two programs are linked in a clever way the arcade game contains clues to the adventure which are revealed as you begin to master it — in fact the arcade game contains the most important information of all, how to start the adventure in the first place

Death Mines of Sirus for the Dragon has for its arcade part, a very good machine code version of Lunar Lander which involves not only landing but also avoiding various meteors along the way

Although the game is addictive and enjoyable in its own right it also gives you the initialising code for the adventure if you get a good enough score

Assuming you discover the code you can begin the adventure which is illustrated with graphics sounds and short animated sections Although the response to the various prompts is single key in most cases the adventure is nevertheless well above the usual Dragon quality

Both sections are therefore impressive in their own rights and most Dragon companies would probably retail either part of the package at around £8 — which makes it excellent value at £9 99 for the two sections Similar games for other micros including the Vic20 and the Spectrum can be expected soon

Program *Death Mines of Sirus*
Price *£9 99*
Micro *Dragon 32*
Supplier *Phoenix Software*
Spangles House
116 Marsh Road
Pinner
Middlesex

WILD WEST

Gunsmoke for the BBC model B is a 3D simulation of a wild west gun fight

The program by Software Invasion depicts the high street in a wild west town From the doors of the shops and houses appear up to 16 deadly gunfighters

You must control a lawman and fight off the bad guys until you have saved the day, or bitten the dust

Program *Gunsmoke*
Price *£7 95*
Micro *BBC B*
Supplier *Software Invasion*
50 Elborough Street
Southfields
London SW18 5DN

New Releases is designed to let people know what software is coming on to the market If you have a new game or utility which you are about to release send a copy and accompanying details to New Releases Popular Computing Weekly 12-13 Little Newport Street London WC2R 3LD

Ziggurat



Mechanical Ideas

In a column such as this the writing part is a piece of cake

The difficult bit is finding something to say Getting the original idea.

Writing games software is similar in some ways It is also supposed to be a creative process

Virgin Games is — so we read (*Popular Computing Weekly* September 29) — changing its approach to the software market Virgin remember, have not been as successful as was hoped when they first launched the company Why? What was the reason for this relative lack of success?

Most people will tell you the reason is quite simple many of the games were not good enough Virgin originally collected the games together by advertising for individuals to supply games Some were not very good and Nick Alexander (managing director) puts this down to the fact that the programmers were just enthusiastic hobbyists

I don't think I agree The main reason why some of the games were not successful is surely the choice of the games in the first place quality control in selection process

Virgin apparently place the blame else where and Nick Alexander seemed to suggest that time is running out for the gifted amateur

Virgin are now developing a system with a multi-user minicomputer running advanced program development software Programmers are apparently to be appointed from the computer courses at the country's top universities (when I read that in the original report, I laughed aloud)

So now we have an advanced system designed for program development All that is missing is ideas

Give me the idea — give anybody who is reasonably competent the idea — and the program will be developed The writing of programs requires some skill but it is certainly not impossible With the correct development software it is made even easier

Ideas cannot be mechanised If they are mechanised — they become mechanical

The reason why certain games are not successful is sometimes the poverty of the writing, but more often then not it is the tattiness of the idea

I have seen many games which have brilliant effects in graphics and sound but which are so boring that all the machine code is wasted

Though I am not a great adventure fan (I always seem to end up with a Bridge over troubled water), I usually find text adventures the most satisfying — the effects have to come from the ideas

Virgin Games and many other companies seem to have reached a situation of over-kill

When they have all these fantastic facilities they will still need the ideas — and the enterprising individual will still have a place ■

Boris Allen

Puzzle

A binding problem

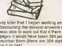
Puzzle No 79

I popped into the printers the other day to collect some pamphlets

Jack was packing up some hefty volumes 'There must be quite a few pages in those books' I remarked

'Well' he said 'This is right up your street because I happen to know that the number of pages in each book is a perfect square, as is the *number of pieces of type* that I needed to number all the pages

'I bet you can't answer that one'



It was only later that I began working on the problem Discounting the obvious answers of 1 and 9 I was able to work out that if there had been 144 pages it would have taken 324 pieces of type to number them (there are 324 digits in the numbers 1 to 144)

However, the books were certainly larger than this How many numbered pages were there in each book?

Solution to Puzzle No 74

The sum is an alphametic in which letters represent digits As there are nine different letters and we are told that zero is not present then each digit must appear once and once only

Thus the smallest value possible for 'EIGHT' is 12345 so 'FOUR' must lie somewhere between 4123 and 9876

```
10 FOR N = 4123 TO 9876 STEP 2 20 LET N$ = STR$ N 30 FOR A = 1 TO 3 40 FOR B = A + 1 TO 4 50 IF N$(A) = 0 OR N$(B) = 0 OR N$(A) = N$(B) THEN GOTO 210 60 NEXT B 70 NEXT A 80 LET Z = N * 3 90 LET Z$ = STR$ Z 100 FOR A = 1 TO 4 110 FOR B = A + 1 TO 5 120 IF Z$(A) = 0 OR Z$(A) = Z$(B) THEN GOTO 210 130 NEXT B 140 NEXT A 150 FOR A = 1 TO 4 160 FOR B = 1 TO 5 170 IF N$(A) = Z$(B) THEN GOTO 210 180 NEXT B 190 NEXT A
```

This gives the answer of

17496/5832 = 3

Winner of Puzzle No 74

The winner is M Madelin Five Acres Close Lindford Bordon Hants who receives £10

Top 10

BBC*

1	(1)	Planetoids	(Acornsoft)
2	(2)	Snapper	(Acornsoft)
3	(4)	Killer Gorilla	(Program Power)
4	(3)	White Knight Mk II	(BBC Soft)
5	(—)	Philosopher's Quest	(Acornsoft)
6	(—)	Hopper	(Acornsoft)
7	(—)	Dr Who, The First Adventure	(BBC Soft)
8	(—)	Arcadians	(Acornsoft)
9	(5)	3D Bomb Alley	(Software Invasion)
10	(—)	747 Flight Simulator	(DACC)

*All Model B

(Figures compiled by Micro Management Ipswich 0473 59181)

ZX81

1	(8)	Football Manager	(Addictive Games)
2	(1)	Flight Simulator	(Psion)
3	(3)	Espionage Island	(Artic)
4	(2)	Space Raiders	(Psion)
5	(7)	Scramble	(Quicksilva)
6	(4)	1K Games	(Artic)†
7	(5)	Fantasy Games	(Psion)
8	(9)	Ship of Doom	(Artic)
9	(6)	Defender	(Quicksilva)
10	(10)	1K Chess	(Artic)†

All run in 16K except where shown † 1K

(Figures compiled by Boots & Co London)



Dragon

1	(7)	Night Flight	(Salamander)
2	(1)	Ring of Darkness	(Wintersoft)
3	(8)	Talking Android Attack	(Microdeal)
4	(3)	Cuthbert Goes Walkabout	(Microdeal)
5	(—)	Space War	(Microdeal)
6	(5)	Champions	(Peaksoft)
7	(6)	Mined Out	(Quicksilva)
8	(—)	Dragon Fly	(Hewson)
9	(4)	Shuttle	(Microdeal)
10	(10)	Franklins Tomb	(Salamander)

(Figures compiled by Boots & Co London)





Vic-20

1	(3)	Grid Runner	(Llamasoft)
2	(1)	Arcadia	(Imagine)
3	(6)	Catcha Snatcha	(Imagine)
4	(5)	Wacky Waiters	(Imagine)
5	(—)	Cosmiads	(Bug-Byte)
6	(—)	Bonzo	(Audiogenic)
7	(4)	Sky Hawk	(Quicksilva)
8	(—)	Home Office	(Audiogenic)
9	(—)	Animalite: Splatter	(Rabbit)
10	(2)	Wizard and the Princess	(Melbourne House)

(Figures compiled by Boots & Co London)

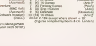


Spectrum

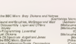
1	(4)	Flight Simulation	(Psion)
2	(—)	Zzoom	(Imagine)*
3	(5)	Trans Am	(Ultimate)
4	(—)	Zip Zap	(Imagine)*
5	(8)	Jet Pac	(Ultimate)
6	(—)	Kong	(Ocean)*
7	(—)	Transylvanian Tower	(Richard Shepherd)
8	(—)	Pool	(CDS)
9	(—)	Race Fun	(Rabbit)*
10	(3)	The Hobbit	(Melbourne House)*

*Requires 48K.

(Figures compiled by W H Smith and Son London)





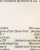


Books

1	(1)	Advanced User Guide for the BBC Micro *Bray Dickens and Holmes*	(Cambridge Micro Centre)
2	(2)	BBC Micro Book, Basic, Sound and Graphics, *McGregor and Watt*	(Addison-Wesley)
3	(5)	Complete Spectrum Rom Disassembly *Logan and O'Hara*	(Melbourne House)
4	(—)	Commodore 64 Exposed *Bayley*	(Melbourne House)
5	(—)	6809 Assembly Language Programming *Leventhal*	(Osborne)
6	(3)	Spectrum Hardware Manual *Dickens*	(Melbourne House)
7	(6)	Advanced Graphics on the ZX Spectrum *Angell and Jones*	(Macmillan)
8	(—)	A Hundred Programs for the BBC Micro *Gamon*	(Prentice-Hall)
9	(10)	Commodore 64 Programmer's Reference Guide *Commodore*	(Commodore)
10	(4)	Structured Programming with BBC Basic *Atherton*	(Harwood)

(Figures compiled by Watford Technical Books Watford 0923 23524 Prestel 28844)

(Last week's position in brackets)



Atari

1	(—)	Blue Max	(Showcase)†§
2	(8)	Empire of the Overmind	(Avalon Hill)†
3	(4)	Zork 1	(Infocom)§
4	(—)	Diamonds	(English)†
5	(—)	Bug Off	(Adventure International)
6	(—)	Arcade Machine	(Broderbund)‡
7	(—)	Preppie	(Adventure International)
8	(—)	Wing Man	(Microprose)¶
9	(—)	Chop Lifter	(Broderbund)*
10	(7)	Deadline	(Infocom)§

*Cartridge † 32K cassette § 32K disc. ¶ 40K disc or cassette ‡ 48K disc.

(Figures compiled by Calisto Computers Birmingham 021 632 6458)

DEAR AUTOMATA PLEASE RUSH ME THE FOLLOWING PRODUCTS		
MY NAME IS UNCLE GROUCHO	48K Spectrum £10	
MORRIS MEETS THE BIKERS	any Spectrum £6	
GO TO JAIL	48K Spectrum £6	
PIMANIA	48K Spectrum £10	
PIMANIA	32k B B C £10	
PIMANIA	Dragon 32 £10	
THE PIMAN'S CHRISTMAS STOCKING (including PiMan 1984 Cartoon Calendar, a PiMan's Own Blank C20 Computer Cassette & THE PIMAN'S GREATEST HITS stereo L P !)	£5*	
I enclose the right money TOTAL	£	

or please charge my ACCESS EURO MASTERCARD

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my signature

my name

my address

POST CODE

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NO EXTRAS ALL PRICES INCLUSIVE PLEASE LEAVE THE FOLLOWING SPACE CLEAR FOR DESPATCH No

"Wow! A saxophone..."

A TERRIBLY HAPPY HALLOWEEN TO ALL OUR FRIENDS OUT THERE FROM LURCH THE OFFICE PARROT, (AT LEAST WE THINK HE'S A PARROT) DON'T BE AFRAID TO ENJOY THE BEST COMPUTER ENTERTAINMENT AROUND. GET SUCKED IN TO THE AMAZING "MY NAME IS UNCLE GROUCHO YOU WIN A FAT CIGAR", OUR 1983 GIANT PRIZE PROGRAM STARRING GROUCHO, THE PIMAN AND A GALAXY OF HOLLYWOOD STARS, WITH A FREE INCREDIBLY HORRIFIC DISCO SINGLE ON EVERY CASSETTE. FIND THE WORLD-FAMOUS SUPERSTAR WE HAVE BURIED IN THE GAME AND YOU CAN WIN A TRIP FOR TWO TO MEET THEM IN PERSON, TRAVELLING SICKENINGLY FAST BY CONCORD, AND DISGUSTINGLY LUXURIOUS QE2, STAYING AT THE WALDORF IN NEW YORK WITH FIVE HUNDRED POUNDS SPENDING CASH. GROUCHO IS STUFFED WITH CARTOONS, MUSIC, HUMOUR AND LATERAL THINKING. IF YOU HAVEN'T PLAYED THE WORLD FAMOUS PIMANIA YET YOU DESERVE TO BE STIFLED BY DOBLOON, WITH ITS £6,000 PRIZE IN GOLD AND DIAMONDS. MANY PIMANIACS HAVE GONE INSANE TRYING TO PLAY IT OR KILLED THEMSELVES LAUGHING. THE FREE MUSIC ON ITS BACKSIDE IS NOW BEING USED BY SEVERAL LEADING S. AMERICAN TERTURERS. AND FOR A REAL NIGHTMARE SITUATION YOU MUST PLAY MORRIS MEETS THE BIKERS WHERE THE KAMIKAZE PHANTOM RIDERS DON'T GIVE A MONKEY'S NOSTRIL ABOUT DOUBLE YELLOW LINES. BEWARE THE POISONOUS CARBON-MONOXIDE, THE TEAR-A-WHEEL CLAMPS AND TYRE SLASHERS AND POOR MORRIS HAS TO ESCAPE THROUGH 9 SCREENS OF PLAY TO GAIN FREEDOM. THE FREE RECORD WITH THIS ONE IS EXCRUCIATINGLY TEAR-JERKINGLY SAD. HOW WOULD YOU LIKE TO BE BEATEN AT THE CLASSIC PROPERTY GAME BY A SINISTER COMPUTER??? WELL, IN GO TO JAIL THIS MAY WELL HAPPEN. WE DARE YOU TO PLAY AGAINST A MACHINE BUT BEWARE IT MAY WELL MASSACRE YOU! IT WILL STEAL ALL YOUR MONEY AND THREATEN TO DOMINATE THE FANTASTIC LARGE SCALE MOVING-BOARD DISPLAY. AND NOW FOR THIS WEEK'S APPALINGLY CORRUPTING COMIC STRIP, FOR THE ADULTS

